Chapter 1

Outline of the M785

1.1 Introduction

This chapter provides the outline features and operation of the M785 including the BIOS Setup program and other system options.

The M785 all-in-one notebook offers the latest in advanced portable computing and multimedia technology that even outperforms most desktop computers. It incorporates the latest Intel Pentium 4 Processor running at 400 /533MHz Front Side Bus. It combines support for the new high-bandwidth Double Data Rate (DDR) 266 SDRAM, Integrated VGA and the AC 97 audio codec. Built-in Windows 98 / Me / 2000 / XP keyboard, glide pad pointing device, sound system, PCMCIA slots, USB (Universal Serial Bus) port, advanced power management and more new multimedia features.

The Intel® Pentium® 4 processor is the evolutionary step for desktop processor technology. Based on Intel® Net Burst™ micro architecture, the Pentium 4 processor offers higher-performance processing than ever before. Built with Intel's 0.13-micron technology, the Pentium 4 processor delivers significant performance gains for use in home computing, business solutions and all your processing needs.

1.2 Feature Highlights

The M785 includes a variety of innovative features:

Features	Description
CPU	• Desktop Intel ® Pentium 4 Northwood Processors using uFCPGA packaging at 2.0 / 2.2 / 2.26 / 2.4 / 2.53 GHz • Support FSB 400/533 MHz.
Cache Memory	• L1 Cache (Pentium Processor internal): 12KB code and 8KB data 8-way cache associatively provides • L2 Cache (Pentium Processor internal): 512KB code and 8KB data 8-way set associative, 32-byte line size, 1 line per sector
Bus Architecture	32-bit PCI/PCI-to-ISA Bus Architecture
Bus Speed	400/533 MHz Front Side Bus

Outline of the M785

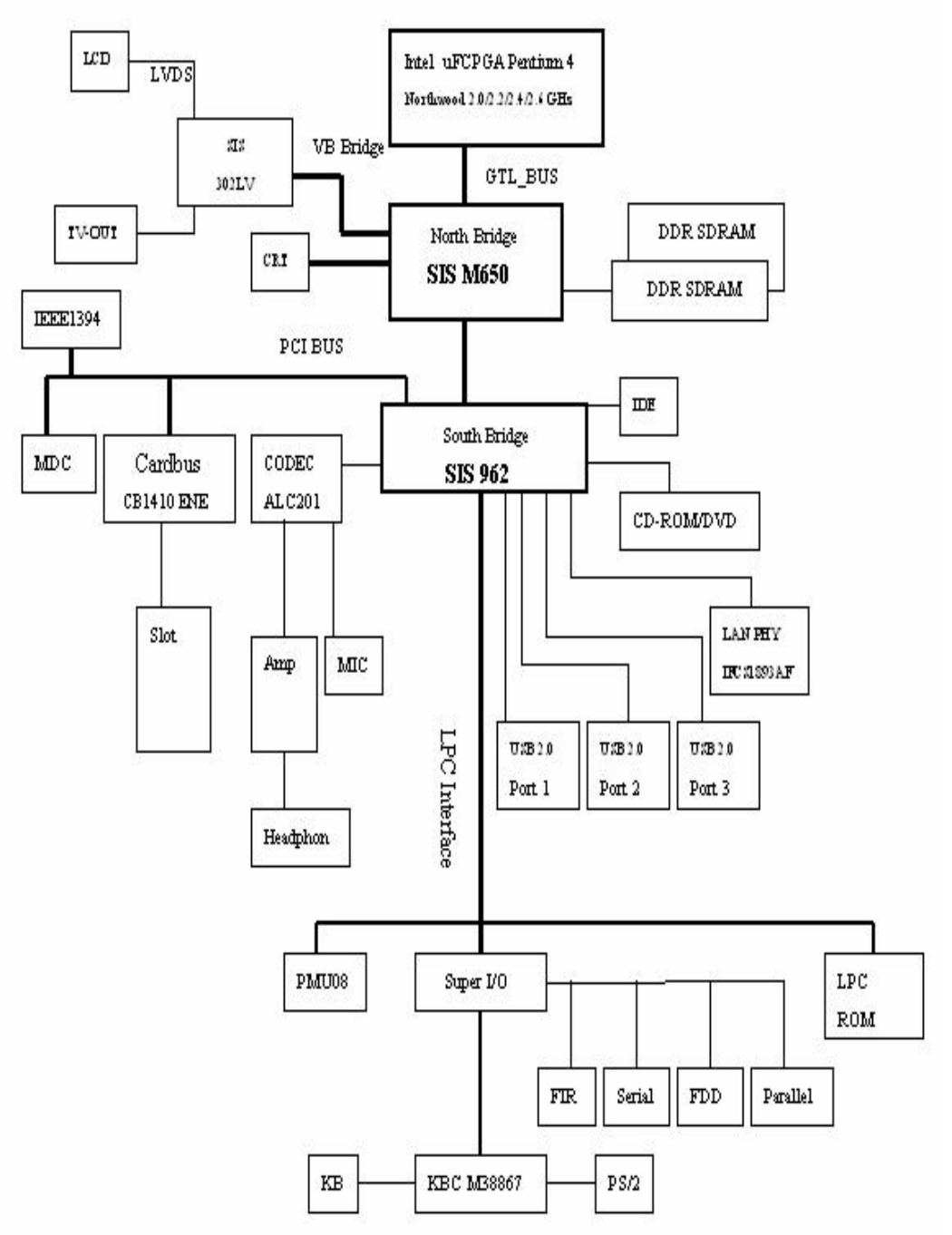
Features	Description
System Memory	• Base Memory: 1 SO-DIMM Slot (1.25”) Size: 128 / 256 / 512MB Type: DDR SDRAM, 2.5V Data Path: 64Bit Frequency: 266MHz Refresh: CBR Refresh • Expansion Memory: 1 SO-DIMM Slot (1.25”) Size: 128 / 256 / 512MB Type: DDR SDRAM, 2.5V Data Path: 64Bit Frequency: 266MHz Refresh: CBR Refresh
Display	• Maximum 32-bit True Color display at 1024x768 pixel resolution for 14" TFT LCD • Brightness controls via hot-key function • 15” XGA and SXGA+ TFT support, 14.1” XGA TFT support
VGA	• Embedded in SIS 650 Chipset • High Performance and high quality 3D accelerator with AGP4X • Integrated VB bridge • High performance 2D accelerator • Complete TV-OUT / Digital Flat Panel Solution • Shared with system memory from 8MB ~ 64MB
HDD	• Built-in (internal) 2.5-inch Format; 9.5mm in Height Enhanced IDE hard drive • 30 GB or above disk drive options • Supports Bus Mastering Ultra-DMA 66 / 100 feature
Optical Device	• Built-in ATAPI IDE 24X+ Speed CD-ROM drive; or • Built-in ATAPI IDE 8X+ Speed DVD-ROM drive; or • Built-in ATAPI IDE 4X+ Speed CD-RW drive ; or • Built-in ATAPI IDE CD-RW/DVD combo drive
FDD	• External USB 3.5-inch 1.44MB floppy disk drive
Keyboard	• 19mm Pitch and 3mm Travel • Built-in 87 / 90-key Windows keyboard • Compatible with IBM enhanced 101 / 102-key keyboard

Outline of the M785

Features	Description
Pointing Device	• Integrated Touch pad (Glide pad) with 2 select click buttons and 1 scroll button • PS/2 mouse interface
PCMCIA Slot	• Single-deck PCMCIA 2.1 card slots that support one Type II PC cards • ENE CB1410 (PCI Card Bus controller) • PC/Card Bus Type II x1 • 32-bit CardBus PCI local bus technology / Supports mixed voltage PC cards (5V and 3.3V)
I/O Port	Includes the following standard I/O ports: • Serial port: 1 port (D-Sub 9 pin) • Parallel port: 1 port (D-Sub 25 pin) • VGA CRT port: 1 port (D-Sub 15 pin) • USB port: 3 port (ver 2.0) • Port Bar: Not support • Headphone : 1 Jack • MIC In: 1 Jack • DC In: 1 port • TV out: RCA Jack • LAN: 1 port • Modem I/F: 1 port • IEEE 1394: 1 port

Features	Description
Audio System	• 16-bit full-duplex sound controller with software wavetable function and FM stereo synthesizer • AC97 Audio Codec / Compatible with Sound Blaster Pro. AC'97 Revision 2.1 Compliant • Integrated 2 high quality paper cone stereo speakers (>1W) with sound boxes and mono microphone • Includes the following: ü Microphone-in jack (MIC-IN) ü Headphone jack ü Volume thumb-wheel knob control
Power System	• Universal Auto-switching19V / 90W AC Adapter (100V – 240V) / Auto-charging capability • Rechargeable Li-Ion (4000mAh/14.8V) Battery Pack • Battery Life: 2 hours (Power Management Off) • Charging Time: 1.5~2 hours quick charge (computer off)
Power Management	• ACPI 1.0B Ready • SMM (Intel System Management Mode) fully supported • Suspend-to-RAM and Suspend-to-Disk feature / Auto Suspend hot-key function / Battery Low Auto Suspend • Cover Switch (Suspend/CRT-only) function
LED Indicator	• 7 x LED Status Indicators for Power Source, Battery Charge, E-Mail, IDE, Caps Lock, Scroll Lock, Num Lock (LCD x 3 + Machine Base x 4)
Modem	• MDC 56Kbps Fax / Data Internal Modem with V.90 support
LAN	• Onboard 10BASE-T and 100BASE-TX LAN

1.3 System Configuration Diagram



1.4 Quick Tour of the Notebook

Please take a moment to become familiar with the location and purpose of every control, the LED status panel, connectors and ports, which are illustrated in this section. It is recommended to first go through the User Guide of the notebook, which is shipped together with the notebook for information on how to operate its features.

1.4.1 Inside the Notebook

To open the LCD cover of the notebook, find the cover latch located at the front center of the LCD cover. Push the latch to the right to release and tilt the LCD cover up. Inside, you will see the LCD display panel, keyboard, touch pad, status LED, and power switch.

❶	Power Status LED Indicator	❷	Built-in Stereo Speakers	❸	Power On / Resume Button
❹	Easy Button	❺	Color LCD Panel	❻	Status LED Indicator
❼	Built-in Stereo Speakers	❽	Keyboard	❾	GlidePad Pointing Device

Figure 1-2 Inside the Notebook

Color LCD Display Panel

The notebook comes with several LCD option sizes at 15” SXGA+ (1400x1050) or 14.1” XGA (1024x768) active-matrix TFT color liquid crystal display (LCD). You can adjust and tilt (up to 180°) the LCD screen panel to your desired viewing position.

The notebook computer comes with a color LCD that you can adjust for a comfortable viewing position. The LCD can be 14.1” TFT color LVDS with 1024x768 XGA (Extended Graphics Array) resolution panels or 15” TFT color LVDS with 1400x1050 resolution. The features of the Color LCD Display are summarized as follows:

- TFT color LVDS with 14.1" 1024x768 XGA or 15" 1400x1050 resolution panels.
- Capable of displaying 16M colors (32-bit true color) on either size panels.

- LVDS display control hot-keys allows you to adjust the brightness of the LCD.
- Simultaneous display capability for LCD and external desktop computer monitor.
- LCD display can be 14.1” or 15" TFT.

The notebook uses SiS®650 Host/Memory controller with AGP4X North Bridge Single Chipset & Built-in High Quality 3D Accelerator VGA graphics controller that owns 8~64MB shared video memory. All LCD models can support 16M colors or maximum 32-bit true color at 1024x768 resolution. The notebook also supports simultaneous display of the LCD with the external VGA monitor.

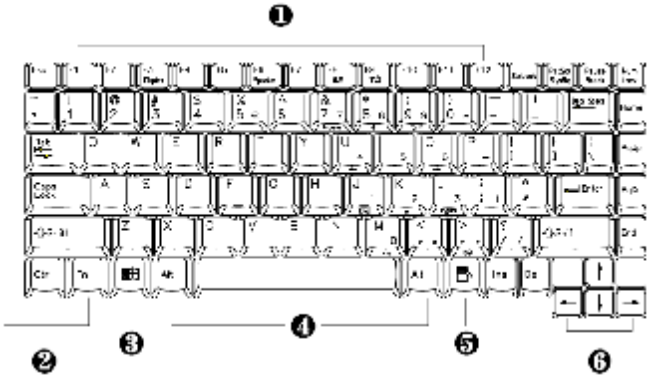
The LCD screen also uses CCFT (Cold Cathode Fluorescent Tube) backlighting which consumes much of the electrical power of the notebook. To save battery power, the system has an advanced power management feature that switches off the LCD when there is no system activity for a predetermined amount of time.

You adjust the brightness level of the LCD by pressing the display control hot-keys. You activate the hot-keys by pressing the **<Fn>** key along with another function key:

- **<Fn>** + **<F8>** Key = Increases the brightness of the LCD display
- **<Fn>** + **<F9>** Key = Decreases the brightness of the LCD display

Keyboard Panel

- Standard QWERTY-key layout and full-sized 87 / 90 keys keyboard with Windows hot-keys, embedded numeric keypad, hot keys, inverted “T” cursor arrow keys, and separate page screen control keys.
- Wide extra space below the keyboard panel for your wrist or palm to sit-on comfortably during typing. (The keypad F4, F5, F7 on the following keyboard should no words print on it.)



Œ	Function Keys	•	Control Keys	Ž	Windows Start Menu Key
•	Windows Short-cut Key	‘	Cursor Control Keys		

Figure 1-3 Keyboard Layout

The notebook keyboard is a little bit different from a standard desktop keyboard. Aside from the normal alphanumeric characters and the standard keyboard function keys, the

notebook keyboard includes an embedded numeric keypad, and special function keys that activates by pressing the <**Fn**> key together with another key. These special function keys or "hot-keys" allow you to control and adjust some of the functions of the notebook like display controls, power saving features, and others.

(1) **Function Keys** — These function keys, out of **<F1>** through **<F12>**, are available on the notebook keyboard. These keys also work together with the **<Fn>** key to activate special functions. The following function-key combinations are pre-programmed:

Hot Key	Function	Handler
Fn + F3	Toggle Display (LCD/CRT/Simul)	BIOS Handler
Fn + F6	Speaker On/Off	BIOS Handler
Fn + F8	Brightness Increase	Controlled by PMU07
Fn + F9	Brightness Decrease	Controlled by PMU07

(2) **Control keys** – **<Ctrl>**, **<Alt>**, **<Fn>**, and **<Shift>** keys are controls used in conjunction with other keys to change their functions. To use control keys, press and hold the control key while pressing another key. For example, "Press **<Ctrl>+ <C>**" means to hold down the **<Ctrl>** key and type the letter **<C>**.

(3) **Windows keys (Windows Start Menu Key) –** Use this key to activate the Start Menu of Windows.

(4) **Shortcut/Application key** – provides quick access to shortcut menus. (This key acts like a right mouse button.)

(5) **Cursor Control keys** – Cursor control keys let you position the cursor on the screen where you want. On the screen, the cursor is a blinking underline, block, or vertical bar depending on the application.

(6) **Typewriter keys** – Typewriter keys (also called *alphanumeric* keys) are used to enter text and characters. Keys with blue print on them behave differently when combined with control keys or the **<Fn>** key.

(7) **Numeric Keypad** – Pressing **<NumLock>** on the keyboard activates the embedded numeric keypad numbers and functions printed in blue on top of the keys. When you press **<NumLock>** again, the keys revert to their normal functions as typewriter keys.

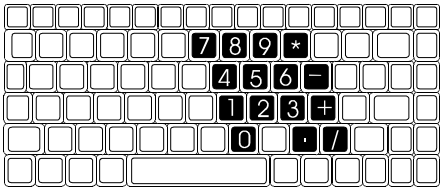


Figure 1-4 Embedded Numeric Keypad

Integrated Microphone

This allows you to instantly record voice annotations (normally saved as WAV files) and later

attached them to documents and presentation using the notebook integrated audio system and application software. Since the notebook also supports full-duplex audio capabilities, you can talk to the microphone and at the same time listen to others talk when connected to a speakerphone modem, Internet live chat, or video conferencing.

Power Status LED Indicator

Located just on TFT LED panel assembly, you will find three LEDs for the power and battery charge status. These LEDs are positioned to be visible even if the LCD cover is closed.

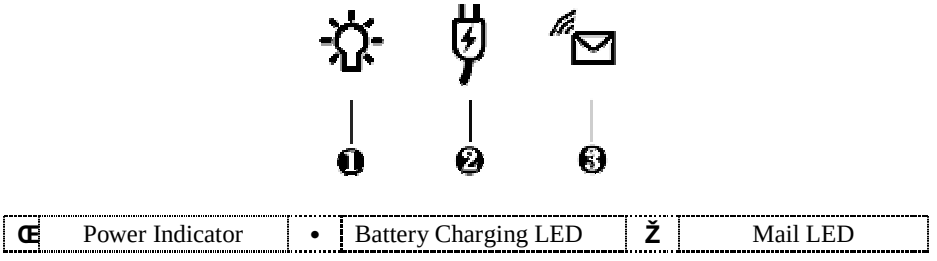


Figure 1-5 Power Status LED Indicator

1. **Power Indicator** – lets you know if power to the system is turned on and if system is in Suspend-to-RAM mode. This LED is positioned so that you can see it on both sides whether the LCD panel is opened or closed.
   - Lights green when the system is powered on using the AC adapter or battery.
   - Lights green blinking when in Suspend to RAM mode and critically low battery power. We strongly recommend that users create the partition "Save to Disk" (for Win98 only) as this will prevent your data from loss when power is critically low. For Windows version later then Win98, please use hibernation mode instead.

2. **Battery Charging LED** – lights to indicate battery in charging status.
   - Lights organge to indicate the battery is charging.
   - Lights off to indicate the battery is fully charged or no battery installed.

3. **Mail LED** – Lights green to indicate that a new mail is arrived.

Status LED Panel

The Status LED Panel keeps you informed of the notebook's current operating status. Each LED is marked with an icon to designate a system status.

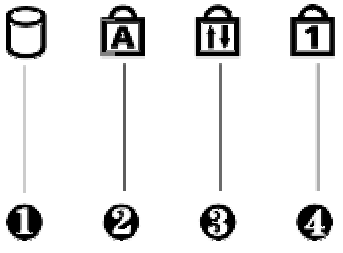
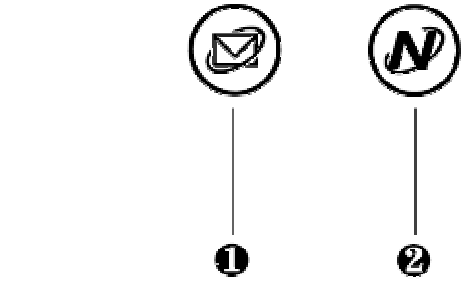


Figure 1-6 Status LED Panel Icons

Icon	Represents	Indicates
Œ	**IDE Drive Access**	This LED will turn on when the system is accessing the hard disk drive (HDD) or CD-ROM / DVD-ROM / CD-RW /Combo.
•	**Caps Lock**	This LED will turn on when the Caps Lock key is activated. When activated, all alphabet keys typed in will be in upper case or in capital letters.
Ž	**Scroll Lock**	This LED will turn on when the Scroll Lock key is activated.
•	**Num Lock**	This LED will turn on when the Num Lock key is activated. When activated, the embedded numeric keypad (blue print numeric keys) will be enabled.

Easy Buttons

There are three easy buttons, two use for accessing Internet and e-mail functions instantly and easily, the other one lets you define certain functions by yourself. Description of the easy buttons appears in the latter part of this section.



Œ	Internet Button	•	E-Mail Button

Figure 1-7 Easy Button

– Internet Button
  This technology is designed specifically for providing a very convenient way in connecting Internet only by pressing Internet button as shown in the graphics. For more understanding and interesting, you can refer Section 2.5 of user manual to recognize the driver installation procedures in activating Internet button.

– E-mail Button
  This is the most convenient way to access the outlook 98/2000... just by pressing this button, you can omit several procedures in entering into Outlook environment.

Power Button

Press the Power button either to power on or power off the system. The Power button is also a "Smart" switch, meaning that it recognizes when the system is in Suspend mode. If in Suspend mode, pressing the Power button will bring it out of Suspend mode and resume to the system's last state. You can set the function of power button from the power management setting in Windows Control Panel. Always check the Power LED after pressing the power button to know the power status of the notebook.

- If you are unable to power off the system, use the power override function. Press the power button and hold it in place for four seconds. The system will then power off.

Touch Pad Pointing Device

Built in just below the keyboard panel is the glide pad pointing device. The left and right select buttons of the glide pad is found below the glide pad surface. The left select button is configured (by default) as the left button you normally click on the left button of your mouse, while the right select key is configured as the right mouse button. The scroll button makes it easy to browse upwards or downwards in the software screen.

To move cursor, place your finger lightly on the glide pad and move in the desired direction. If you reach the end of the pad, lift your finger and place it back down on the other side.

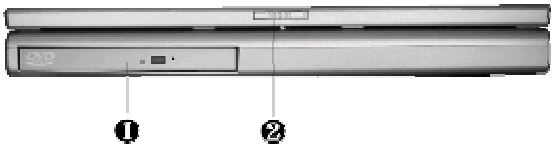
The glide pad is compatible with the standard PS/2 mouse and can be activated using the normal DOS or Windows PS/2 mouse driver. You can also disable the glide pad in the BIOS Setup program.

- You can execute a left button click function by simply tapping on the glide pad surface once. Refer to the User Guide of the notebook for more information.

Built-in Stereo Speakers

At the front left and right sides of the base unit are two built-in stereo mini speakers with sound boxes. The speakers are controlled by the audio controller of the notebook and activated by installing the audio driver. For adjusting the volume of the speakers, you can use the volume control program under Microsoft OS or by adjusting the thumb-wheel volume knob also found on the right side of the notebook.

1.4.2 Front Side of the Notebook



Œ	CD-ROM, DVD-ROM, CD-RW/DVD Combo	•	Cover Switch

Figure 1-8 Front Side of the Notebook

Cover Switch

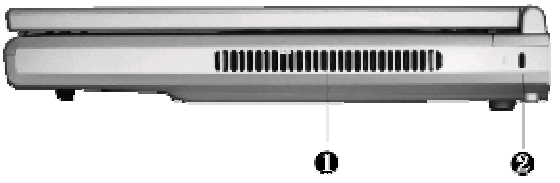
The Cover Switch is found inside the notebook assembly just underneath the latch opening where you insert the LCD cover hook. Whenever the LCD cover is closed, it activates the Suspend mode or shut down the computer. The action can be set on Power Option of Windows Control Panel.

- When Suspend-to-RAM mode is activated, make sure not to leave the system for a long period when running at battery mode. The battery will continue to drain some power even in Suspend mode. It is better to save all files and shutdown the power instead or run Suspend-to-Disk mode.

CD-ROM, DVD-ROM, CD-RW, CD-RW/DVD Combo

Allows you to load and start programs from a compact disc (CD) or a digital video disc (DVD) and play conventional audio CDs.

1.4.3 The Right Side of the Notebook



Œ	Air-Outlet Vent	•	Locking Device Keyhole

Figure 1-9 Right Side of the Notebook

Air Inhalant

Inhale the air into your computer to keep it within operating temperature

1.4.4 The Left Side of the Notebook

Œ	IR Port	•	Microphone Jack	Ž	Headphone Jack
•	Volume Control	❺	PC Card Slots		

Figure 1-10 Left Side of the Notebook

IR Port

Wireless data transfer of files between your notebook computer and an IR-equipped device or notebook computer. You can also print to an IR-equipped printer without using cables. The SIR mode provides up to 115.2Kbps of data transfer rate

Microphone Jack

Allows you to connect an external microphone for monophonic sound recording directly into your notebook computer. Plugging in an external microphone disables the built-in microphone.

Headphone Jack

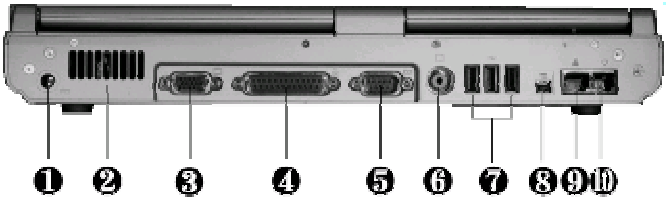
Lets you plug in a stereo headphone, powered speakers, or earphone set with 1/8 inch phono plug or SPDIF connector for personal listening

Volume Control

Allows you to control the speaker volume

PC Card Slots

1.4.5 The Rear Side of the Notebook



Œ	AC Power Port	•	Air Inhalant	Ž	CRT Port
•	Parallel Port	•	Serial Port	‘	TV-Out Port
’	USB Port	“	IEEE 1394 Port	”	LAN Port
❿	Modem Port				

Figure 1-11 Rear Side of the Notebook

AC Power Port

Lets you attach the notebook to the AC power source using the AC adapter that comes with your system. Keep the system connected to AC power whenever possible to keep the battery pack and internal CMOS battery charged. The Battery Charge LED will activate whenever the battery is being recharged.

Parallel Port

Use this port to connect a parallel printer or other parallel device. The parallel port supports Enhanced Capabilities Port (ECP) standard. The standard provides you with a greater processing speed than the conventional parallel port. The port also supports Bi-directional and EPP protocols.

- The default setting for the parallel port on your notebook computer is set to Enhanced Capabilities Port (ECP). Some older parallel devices may not function with the ECP default setting. You may need to adjust the setting to accommodate your parallel device by changing the BIOS setting.

TV-Out Port

Lets you connect to a S-video TV connector for presentation or VCD, DVD watching.

Air Inhalant

Inhale the air into the computer to keep it within operating temperature.

CRT Port

The VGA port lets you connect an external VGA (CRT) monitor to the notebook. You can also run the LCD and the external CRT monitor display simultaneously; or switch it to CRT only using the function hot key (Fn+F3). When switch to CRT only, you can set the display resolution up to 1024x768 at (16-bit true color).

Serial Port (COM 1)

The 9-pin serial port provides a serial interface to which you can connect an RS-232C device such as external serial mouse or modem. This port is commonly referred to as COM1.

- When connecting an external serial mouse, you must first power off the system before connecting the external mouse. It can auto-detect the serial mouse hardware and run both glide pad and serial mouse simultaneously.
- Whenever using an external mouse in place of the built-in glide pad, it is recommended to switch the mouse driver to the default standard Microsoft mouse driver.

LAN Port

If you purchase an internal 10Base-T/100Base-TX LAN module, it connects your computer to other computers/networks through a local area network (LAN).

Modem Port

The modem port provides a reserve jack for installing an internal modem with RJ-11 jack. The internal modem is a 56Kbps-fax/data PCI modem and supports the latest V.90 standard. The internal module uses MDC (AC'97) S/W Modem technology.

USB (Universal Serial Bus) Ports

The USB (Universal Serial Bus) Port is a port with the symbol . This 4-pin slim port allows you to connect multiple USB devices through daisy chaining or through a USB hub and use them all simultaneously. The USB specification states it can support up to 127 USB devices running at up to 12Mbps based on USB specification v1.1. This notebook provides four USB ports.

- When you resume the system from suspend mode, the USB port may not initialize properly. If in case the USB device does not work, unplug and plug the USB device again. This is a known bug released by Intel and Microsoft Windows.

IEEE 1394

IEEE 1394 port is a high speed I/O port that can transfer high levels of data in real-time, such as external hard disk, Digital Video Camera.

1.4.6 The Under Side of the Notebook

Œ	Battery Release Latch	•	Battery Bay

Figure 1-12 Under Side of the Notebook

Battery Release Latch

Also found on the underside of the notebook is the battery bay latch. To remove the battery pack, you need to push aside this latch and at the same time pull the battery pack.

Battery Bay

The battery compartment stores the Lithium-Ion (Li-Ion) battery pack for off-the-cord operation. The battery pack is instantly charge whenever you connect the AC adapter to the notebook. It is very important to always have the battery installed on the notebook to have it always charged and conditioned by the AC adapter. Normal operating time using Li-Ion battery pack is close to 2hours with power management.

1.5 System BIOS SETUP Program

The notebook uses the Phoenix BIOS Setup program that allows you to set several system configurations in changing the way the system performs. This includes your system time and date, disk drive configuration, I/O device controls, boot drive sequence, and power management settings. The information is then stored in the CMOS RAM chip and will remain permanent unless you change it again. The notebook also uses EPROM Flash BIOS that allows you to update the system BIOS by simply overwriting it using the Phoenix Flash programming utility.

Before boot-up, the system will read the BIOS settings and compare them to the equipment check conducted during the POST (Power-On Self-Test). If an error occurs, an error message will be displayed on the screen, and you will then be prompted to run the BIOS Setup Program. Press the <**F2**> key to run the BIOS Setup program. The BIOS Setup program is organized into five menus which you can select using the < ß > and < à > keys. To move from one option to another, you use the up and down arrow keys.

On the BIOS Setup program, you will find the following parts on the screen:

- **Menu Bar** - found on the top line of the screen. Each of the five items has a separate menu screen.
- **Parameters** - found on the left side of the screen. This area lists the parameters and their current settings.
- **Item Specific Help** - found on the right side of the screen. This area describes each parameter and its available settings.
- **Key Status Bar**- the bottom part of the screen. These lines display the keys available to move the cursor, select a particular function and so forth.

The following table lists the keys on how to edit and move around the setup menus inside.

KEY	WHAT IT DOES
<F1>	Shows on-line help on key functions.
↑ ↓	Moves the cursor between the displayed parameters.
+ / -	Modifies the current parameter settings.
<F9>	Load default configuration.
Esc	Exits the current menu and returns to the main menu or go directly to the Exit menu.
ß à	Changes between displayed menus.
<Enter>	For some parameter settings, select and moves the cursor between the sub-menu. Also moves the cursor to the next line or selection.
<F10>	Save changes and exit.

o Some information here may not be available or different from other date code versions of the notebook BIOS. Always check for the latest BIOS update from the FIC Internet homepage. ftp://pcg.fic.com.tw/NBTECH

1.5.1 Using the Main Menu

The BIOS Setup Main Menu contains the settings for system time and date, and disk drives as well as CPU and system memory information.

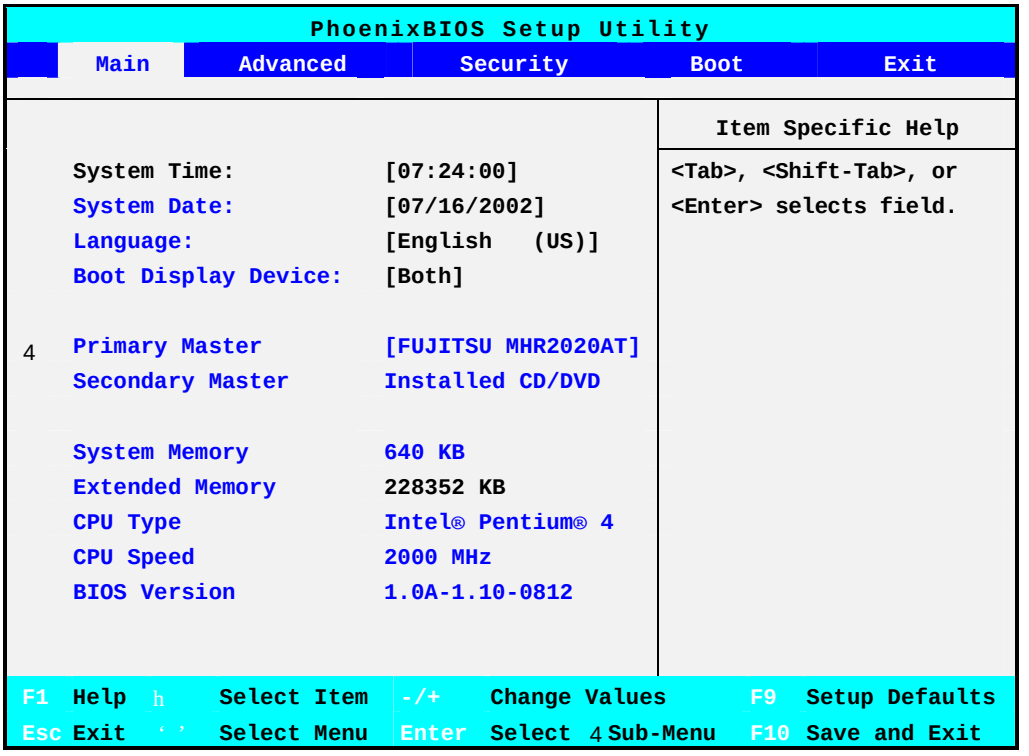


Figure 1-12 BIOS Setup Main Menu

System Time:	[07:24:00]	<Tab>, <Shift-Tab>, or <Enter> selects field.
System Date:	[07/16/2002]	<Tab>, <Shift-Tab>, or <Enter> selects field.
Language :	**[English (US)]**	(BIOS auto detect, for information only)
Boot Display Device:	**[Both]** / [LCD] / [CRT]	Select the display device.
▶ Primary Master	[FUJITSU MHR2020AT]	
Secondary Master	Installed CD/DVD	(BIOS auto detect, for information only)
System Memory	640 KB	(BIOS auto detect, for information only)
Extended Memory	228352 KB	(BIOS auto detect, for information only)
CPU Type	Intel® Pentium® 4	(BIOS auto detect, for information only)
CPU Speed	2000MHz	(BIOS auto detect, for information only)
BIOS Version	1.0A-1.10-0812	(BIOS auto detect, for information only)

- **System Time** – To set the time, enter the current hour, minute, and second on hr/min/sec, 24-hour format.

- **System Date** – This field lets you set the calendar month, day, and year. The calendar clock remains in memory even after you turn off the system.

- **Language** – Language for each country. Default setting as US language.

- **Boot Display Device** – This field allows you to set the output boot display to the LCD, CRT, or Both.

- **Primary Master** – This field displays various parameters for the hard disk drive. If type [Auto] is selected, the system automatically sets these parameters. If type [User] is selected, Cylinders, Heads and Sectors can be edited.

- **Secondary Master** – This field displays various parameters for the internal CD-ROM or a DVD-ROM / Combo Drive.

- **System Memory, Extended Memory, CPU Type, CPU Speed and BIOS Version** – These fields are for information only as the BIOS automatically detects related values.

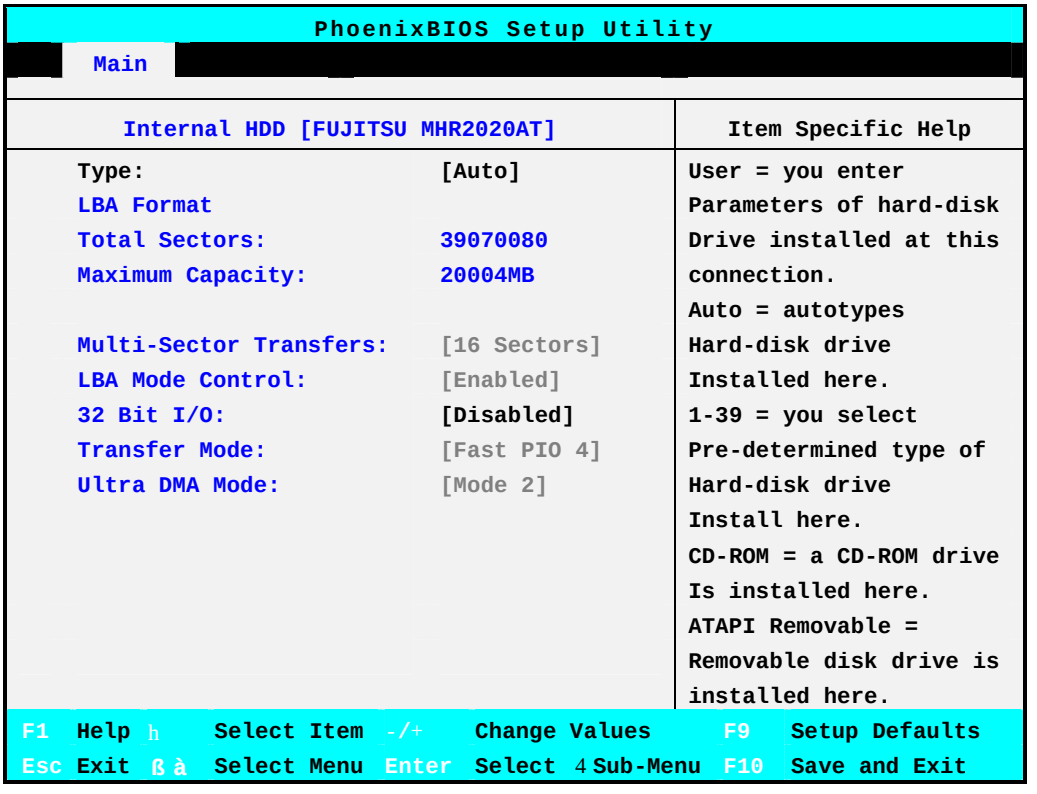

PhoenixBIOS Setup Utility
Main
Internal HDD [FUJITSU MHR2020AT]
Item Specific Help
Type: [Auto]
LBA Format
Total Sectors: 39070080
Maximum Capacity: 20004MB
Multi-Sector Transfers: [16 Sectors]
LBA Mode Control: [Enabled]
32 Bit I/O: [Disabled]
Transfer Mode: [Fast PIO 4]
Ultra DMA Mode: [Mode 2]
User = you enter Parameters of hard-disk Drive installed at this connection.
Auto = autotypes Hard-disk drive Installed here.
1-39 = you select Pre-determined type of Hard-disk drive Install here.
CD-ROM = a CD-ROM drive Is installed here.
ATAPI Removable = Removable disk drive is installed here.
F1 Help
Select Item -/+
Change Values F9 Setup Defaults
Esc Exit
Select Menu Enter Select 4 Sub-Menu F10 Save and Exit

Figure 1-13 Internal HDD/CD-ROM Sub-Menu

Type: Total Sectors: Maximum Capacity:	[None] / [ATAPI Removable] / [CD-ROM] / [User] / **[Auto]** 39070080 20004MB	Select the drive type corresponding to the fixed disk installed in your system. If type USER is selected, Cylinders, Heads & Sectors edited directly. (BIOS auto detect, for information only) (BIOS auto detect, for information only)
Multi-Sector Transfers:	[Disabled] / [2 Sectors] / [4 Sectors] / [8 Sectors] / **[16 Sectors]**	Determine the number of sectors per block for multiple sector transfers.
LBA Mode Control:	[Disabled] / **[Enabled]**	Enabling LBA causes Logical Block Addressing to be used in place of Cylinders, Heads & Sectors
32 Bit I/O:	**[Disabled]** / [Enabled]	This setting enables or disables 32 bit IDE data transfers
Transfer Mode:	[Standard] / [Fast PIO 1] / [Fast PIO 2] / [Fast PIO 3] / **[Fast PIO 4]** / [FPIO 3 / DMA1] / [FPIO 4 / DMA2]	Select the method for moving data to/from the drive. Autotype the drive to select the optimum transfer mode
Ultra DMA Mode:	[Disabled] / [Mode 1] **[Mode 2]**	(BIOS auto detect, for information only)

1.5.2 Using the Advanced Menu

The Advanced Menu allows you to configure the OS and I/O device settings.

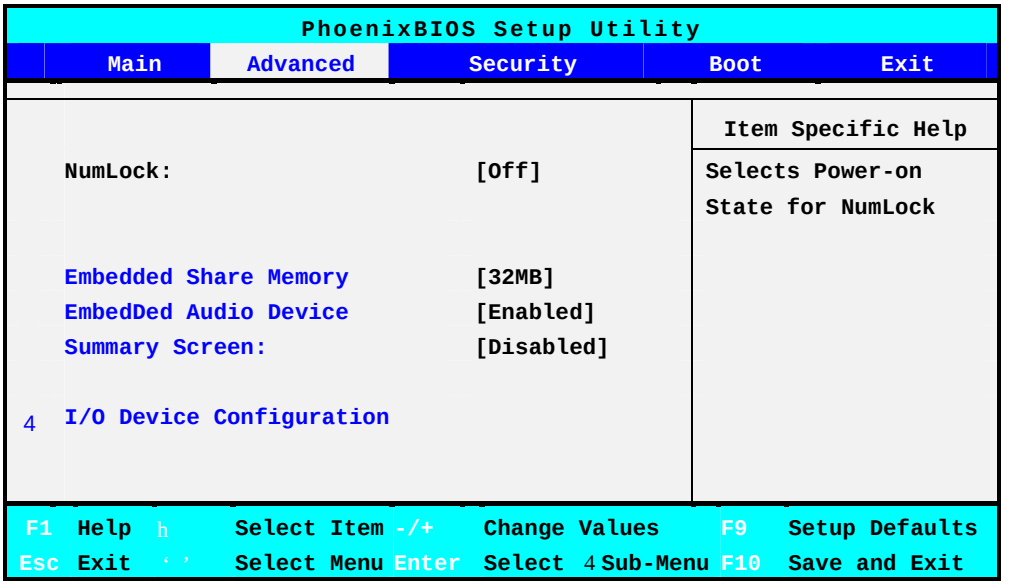


Figure 1-14 BIOS Setup Advanced Menu

NumLock:	[On] / **[Off]**	Selects Power-on state for NumLock
Embedded Share Memory	[8MB] / [16MB] / **[32MB]** / [64MB]	Embedded Share Memory size for AGP VGA memory.
EmbedDed Audio Device	**[Enabled]** / [Disabled]	Enabled or Disabled SiS Embeded Audio (SiS 7018 AC97 Audio)

Summary screen:	**[Disable]** / [Enabled]	Display system configuration on boot
4 I/O Device Configuration	Submenu	Peripheral Configuration

- **Num-Lock on Boot** – Allows you to set the power-on state for the <NumLock> key. Set this to [LockOn] if you want to enable <NumLock> during power on.
- **Embedded Share Memory –** [8MB] [16MB] [32MB] [64MB] – Embedded Share Memory AGP VGA Memory Size.
- **EmbedDed Audio Device –** [Enabled] or [Disabled] SiS Embeded Audio (SiS 7018 AC97 Audio)
- **Summary Screen** – Select the display of configuration on Boot.
- **I/O Device Configuration** – Lets you configure input/output device such as Serial Port, Parallel Port, and Floppy disk controller.

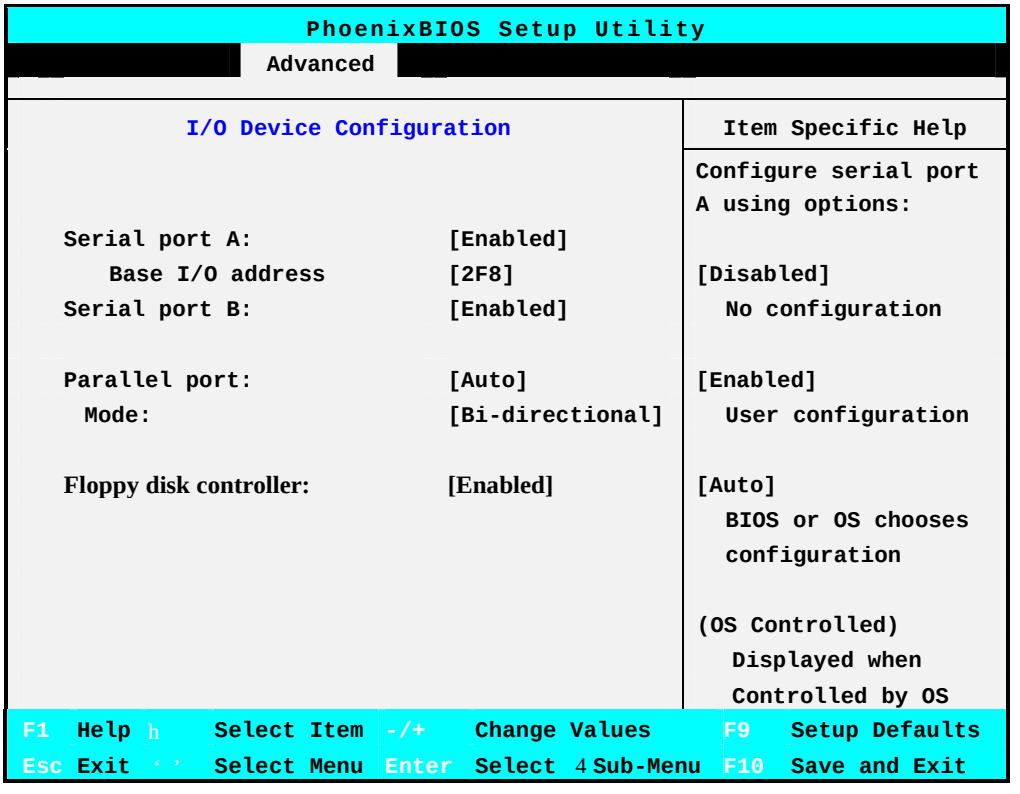

PhoenixBIOS Setup Utility
Advanced
I/O Device Configuration
Item Specific Help
Configure serial port A using options:
Serial port A: [Enabled]
Base I/O address [2F8]
Serial port B: [Enabled]
Parallel port: [Auto]
Mode: [Bi-directional]
Floppy disk controller: [Enabled]
[Disabled] No configuration
[Enabled] User configuration
[Auto] BIOS or OS chooses configuration
(OS Controlled) Displayed when Controlled by OS
F1 Help h Select Item -/+ Change Values F9 Setup Defaults
Esc Exit ‘ ’ Select Menu Enter Select 4 Sub-Menu F10 Save and Exit

Figure 1-15 I/O Device Configuration Sub-Menu

Serial port A	[Disabled] / [Enabled] / **[Auto]**	Configure serial port A using options: Disabled - No configuration, Enabled - User configuration, Auto - BIOS or OS configuration. (OS Controlled) – Displayed when

		controlled by OS
Serial port B	[Disabled] / **[Enabled]** / [Auto]	Configure serial port A using options: Disabled - No configuration, Enabled - User configuration, Auto - BIOS or OS configuration. (OS Controlled) – Displayed when controlled by OS
Mode:	**[IrDA] [FIR]**	Enabled the IrDA transmission
Base I/O address/IRQ	[3F8] / **[2F8]** / [3E8] / [2E8]	Set the base I/O address and IRQ for serial port B.
Interrupt	**[IRQ 3]** / [IRQ4]	Set the interrupt for serial port B.
Parallel port	[Disabled] / **[Auto]** / [Enabled]	Configure parallel port using options: Disabled - No configuration, Enabled - User configuration, Auto - BIOS or OS configuration.
Mode	**[Bi-directional]** / [EPP] / [ECP]/	Set the mode for the parallel port using options: Output only, Bi-directional
Base I/O address	**[378]** / [278] / [3BC]	Select the base I/O address for the parallel port when port is Enabled.

o If you disable a device in BIOS Setup, you cannot enable or assign it using the Windows (98 or 2000) Device Manager. The device is not listed in the Windows device list. You need to select any setting other than “Disable” in Setup.

- **`Serial Port`** A – You can press <**Enter**> to select Enabled, Disabled, or Auto option for enabled or disabled the port, or automatically sensed the address assignment by BIOS or OS.

- **`Serial Port`** B – You can press <**Enter**> to select Enabled, Disabled, or Auto option for enabled or disabled the IrDA, or automatically sensed the address assignment by BIOS or OS.

- **`Mode`** – Allows you to press <**Enter**> to select a serial mode B as 3F8, 2F8, 3E8 & 2E8 when the serial port B is configured. When you set the configured serial port B to Enabled rather than Auto, you should also set the parameter of Base I/O address and IRQ for this port.

- **`Parallel Port`** – Allows you to press <**Enter**> to select the Enabled, Disabled, or Auto option for enabled or disabled this port, or automatically sensed the address assignment by BIOS or OS.

- **`Mode`** – Allows you to press <**Enter**> to select a parallel mode as Bi-directional, EPP, or ECP when the parallel port is configured. When you set the configured parallel port to Enabled rather than Auto, you should also set the parameter of Base I/O address and IRQ for this port.

1.5.3 Using the Security Menu

The Security menu allows you to set the system password as well as disk-protection security.

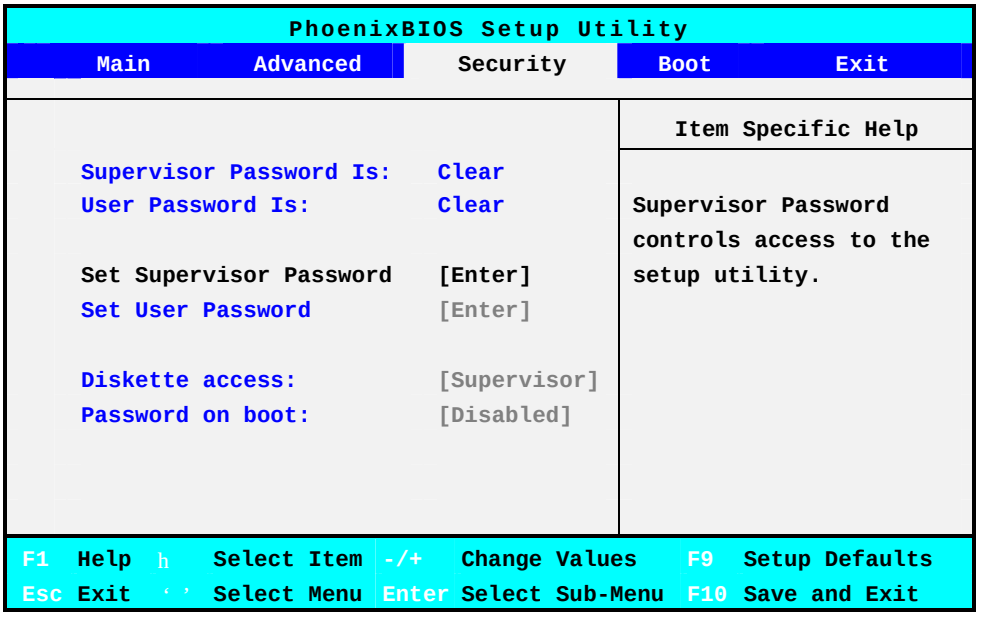

PhoenixBIOS Setup Utility
Main
Advanced
Security
Boot
Exit
Item Specific Help
Supervisor Password Is: Clear
User Password Is: Clear
Set Supervisor Password [Enter]
Set User Password [Enter]
Diskette access: [Supervisor]
Password on boot: [Disabled]
Supervisor Password controls access to the setup utility.
F1 Help h Select Item -/+ Change Values F9 Setup Defaults
Esc Exit ‘ ’ Select Menu Enter Select Sub-Menu F10 Save and Exit

Figure 1-16 BIOS Setup Security Menu

Supervisor Password Is:	**Clear** / Set	While the Supervisor Password had been enabled, the item will show Set. If disabled. The item will show Clear.
User Password Is:	**Clear** / Set	While the User Password had been enabled, the item will show Set. If disabled. The item will show Clear.
Set Supervisor Password	Press [**Enter]**	Supervisor Password controls access to the setup utility.
Set User Password	Press **[Enter]**	User Password controls access to the system.
Diskette access	[User] / **[Supervisor]**	Control access to diskette drives.
Password on boot	**[Disabled]** / [Enabled]	Enabled password entry on boot

- **Supervisor Password Is: Clear** / Set –While the Supervisor Password had been enabled, the item will show Set. If disabled. The item will show Clear.
- **User Password Is:** -- **Clear** / Set – While the User Password had been enabled, the item will show Set. If disabled. The item will show Clear.
- **Set Supervisor Password** – Specifies if the system prompts you to enter a password when entering Setup.

- **Set User Password** – Specifies if the system prompts you to enter a password when accessing the system. The Set User Password function will be enabled once a Supervisor password is set. Enter a new password with up to eight alphanumeric characters, and then enter this same new password again for confirmation.

- **Diskette access** – Controls access to diskette drive.

- **Password on boot** – Enables password check when booting.

1.5.4 Using the Boot Menu

The Boot menu lets you decide the boot order of booting devices including:

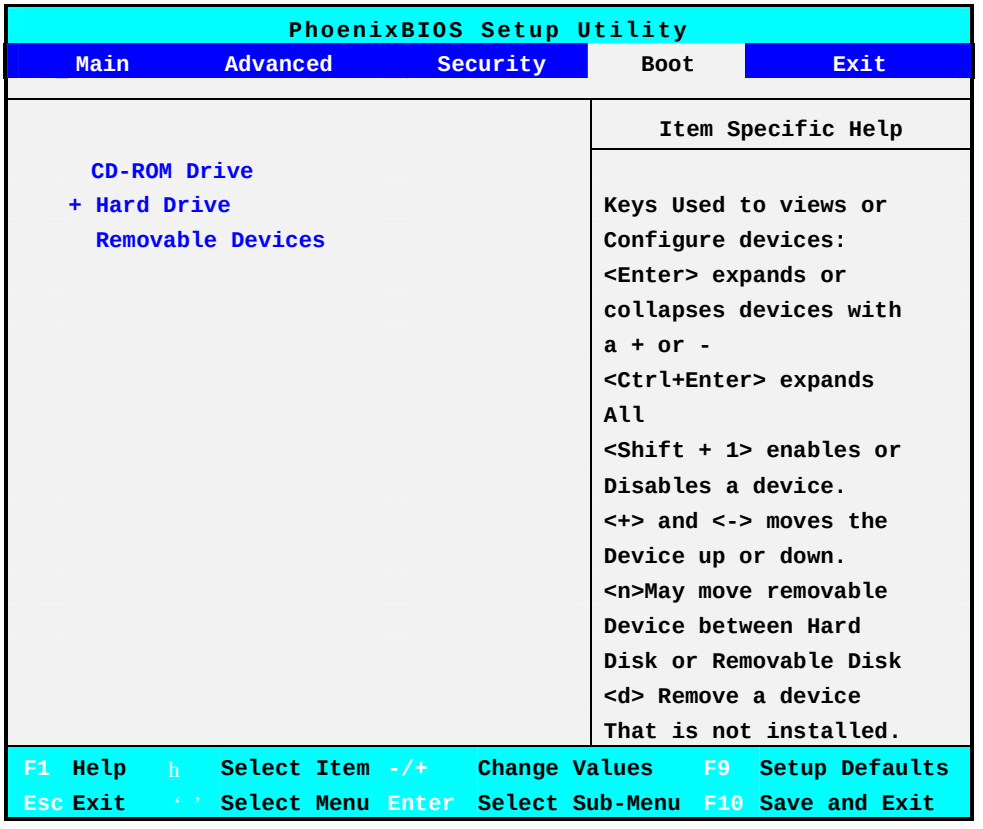

PhoenixBIOS Setup Utility
Main
Advanced
Security
Boot
Exit
Item Specific Help
CD-ROM Drive
+ Hard Drive
Removable Devices
Keys Used to views or Configure devices:
<Enter> expands or collapses devices with a + or -
<Ctrl+Enter> expands All
<Shift + 1> enables or Disables a device.
<+> and <-> moves the Device up or down.
<n>May move removable Device between Hard Disk or Removable Disk
<d> Remove a device That is not installed.
F1 Help h Select Item -/+ Change Values F9 Setup Defaults
Esc Exit ‘ ’ Select Menu Enter Select Sub-Menu F10 Save and Exit

Figure 1-17 BIOS Setup Boot Menu

- **CD-ROM Drive** – Move the option on top if you want to boot from a bootable CD-ROM like Windows NT/2000/XP (Optical Drive D:\).

- **Hard Drive** – Move the option on top if you want to boot from a bootable hard disk drive (Drive C:\)

- **Diskette Devices** – Move the option on top if you want to boot from a bootable floppy diskette (Drive A:\).

1.5.5 How to Exit the Setup Program

There are two choices to escape from the Setup program.

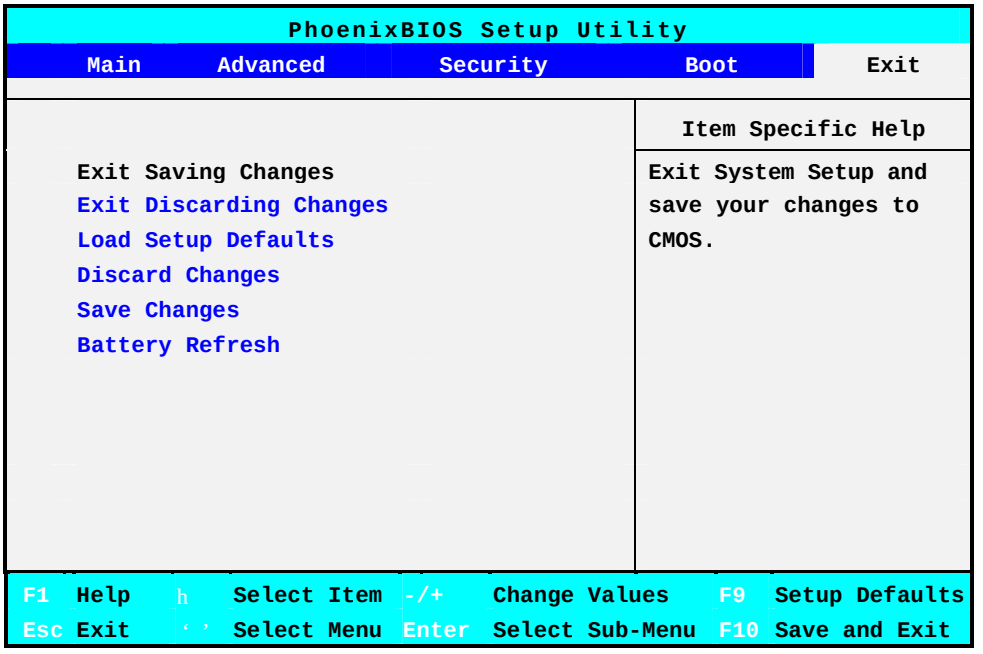


Figure 1-18 BIOS Setup Exit Menu

- **Exit Saving Changes** – Exits System Setup and saves your changes to CMOS.
- **Exit Discard Changes** – Exits Setup utility without saving Setup data to CMOS.
- **Load Setup Defaults** – Loads the default settings for all items in Setup.
- **Discard Changes** – Reverts to previously selected settings.
- **Save Changes** – Saves Setup data to CMOS.
- **Battery Refresh** – Reactivate both Li-Ion and Ni-MH battery.

1.6 Notebook Accessories and System Options

It is also important to understand the accessories that come along with the notebook and the options for fully utilizing the capabilities of the computer. This section describes briefly what these accessories and options are.

1.6.1 AC Adapter and Power Cord

The AC Adapter supplies external power to your computer and at the same time charges the internal battery pack. The AC adapter has an auto-switching design that can connect to any 100VAC ~ 240VAC power outlets. Connect the adapter to the AC wall outlet using the power cord. There is an LED on the AC adapter to indicate if DC power is already available.

1.6.2 Battery Pack

Aside from the AC adapter, your computer can also be powered through the removable battery pack. The battery pack uses rechargeable or Lithium-Ion (Li-Ion) battery cells that can run for 2 hours when fully charged and power management enabled. Recharging the battery takes around 2 hours when the computer is off.

You should always leave the battery inside your computer even when using the AC adapter as it also acts as back-up power supply in case power from the AC adapter is cut off. It is also very important to have the battery pack always charged to prevent battery cell degradation. If the AC adapter is not connected or not available, and the notebook is not going to be used for some period, it is advisable to remove the battery pack from the notebook to prevent any current leak.

1.6.3 DVD-ROM Drive

Other than the internal CD-ROM drive, the notebook also provides optional factory built-in DVD-ROM drive. DVD-ROM drives are also backward compatible with CD-ROM, so you can also use any audio CDs, video CDs, photo CDs, and CD-R. Using a software MPEG-2/DVD program, the notebook can playback any commercial DVD movie titles.

1.6.4 CD-RW Drive

This device pack can write data to CD-R or CD-RW CD for you to backup the data.

1.6.5 CD-RW/DVD Combo Drive

This device pack can write data to CD-R or CD-RW CD for you to backup the data and also can read DVD/CD title.

Chapter 2

Installation and Upgrade

2.1 Overview

This chapter provides guidelines on installing the device drivers for the built-in features of the M785. Most of the driver installation procedures mentioned here are only for Windows XP Windows 2000, and Windows Me. This chapter also includes procedures on how to upgrade major internal system components like CPU, memory, hard disk, and feature card modules.

2.2 Notebook Drivers and Utilities

The notebook requires several device drivers that you need to install and setup before you can fully operate the notebook. These are:

- SiS 650 VGA Driver – Windows XP , Windows 2000 , Windows Me
- Realtek PCI Audio controller Driver – Windows XP , Windows 2000 , Windows Me
- Alps Touch Pad Driver – Windows XP , Windwos 2000 , Windows Me
- Askey MDC Modem Driver – Windows XP , Windows 2000 , Windows Me
- SIS LAN Driver– Windows XP , Windows 2000 , Windows Me
- EzButton Driver – Windows XP , Windows 2000 , Windows Me
- SMSC FIR Driver – Windows XP , Windows 2000 , Windows Me
- EzMail Driver – Windows XP , Windows 2000 , Windows Me
- Ezbuttom Driver – Windows XP , Windows 2000 , Windows Me

i Visit FIC Support website FTP://FTP.PCG.FIC.COM.TW/NBTECH latest driver updates.

2.2.1 Installing Windows XP from Optical Devices

This section provides Windows XP installation guide from the Optical Devices (Such as CD-ROM or DVD-ROM device.)

Installing Windows XP from Optical Devices

To install Windows XP directly from your CD-ROM or DVD-ROM, please go to **Boot** menu of **BIOS** setup menu. Use arrow key to select "CD-ROM Drive", then use "+" or "-" to move it to the top. Go to **Exit** menu and select **"Exit Saving Changes".**

To install Windows XP directly from your CD-ROM or DVD-ROM, insert Windows XP installation CD into CD-ROM drive and boot on the notebook. Follows the screen instructions on the screen.

2.2.2 Installing the VGA Device Driver

Your notebook computer uses the high-performance SiS 650 VGA controller, which is an AGP 4X video local bus, 2D/3D Graphic Engine. Following is the procedure for installing the VGA Driver for Windows XP:

Installing VGA Driver for Windows XP

Following is the procedure for installing the Video Accelerator 3D Adapter (English) VGA driver to your computer:

1. Click the **Start** button, and then point to **Run**. The Run dialog box appears.

2. Click the **Browse** button and specify the directory as.
"E:\Drivers\WinXP\VGA\Setup.exe"

3. Implement the setup program to install this driver. The Welcome dialog box appears.

4. Click **Next** to process the further step continuously when screen displays this command.

5. Press **Finish** to restart your system.

2.2.3 Installing the Audio Device Driver for Windows XP

Your notebook computer uses Realtek Audio Controller.

1. Click the **Start** button, and then point to **Run**. The Run dialog box appears.

2. Click the **Browse** button and specify the directory as.
"E:\Drivers\WinXP\Audio\Setup.exe" where the audio driver is located

3. Implement the setup program to install this driver. The Welcome dialog box appears.

4. Click **Next** to process the further step continuously when screen displays this command.

5. Press **Finish** to restart your system.

2.2.4 Installing EzButton Driver for Windows XP

Following is the procedure for installing the Internet, e-mail button and Audio DJ keys.

Installing EzButton driver for Windows XP

1. Boot WinXP from your hard disk and insert the disc containing the EzButton driver for WinXP.

2. Double-click on the System icon, Hardware and then click on the Device Manager folder tab.

3. Double-click Standard 101/102 key or Microsoft Natural PS/2 keyboard... and Select Update Driver

4. Select Install from a list of specific location (Advanced) and then click Next

5. Tick on "Include this location in the search". Then, click Browse button and navigate to the EzButton driver location as "E:\Drivers\WinXP\EzButton". Click Next to begin searching the driver.

6. The Add New Hardware will found Keyboard en3886... Click Next to continue the driver installation.

7. Click Finish button to finish installing EzButton driver.

8. Click Yes to restart the computer

2.2.5 Installing Easy Mail Light Driver for Microsoft Outlook 98/2000...

1. Installing Easy Mail Light driver for Windows XP

2. Boot Windows from your hard disk and insert the disc containing the Easy Mail Light button driver.

3. Click the Start button, then click Run. In the Run dialog box, click Browse button and navigate to the directory as "E:\Drivers\WinXP\EzMail\EzMail.exe"

4. Run the execution file for installing the EzMail driver, and then click Finish after complete the installing procedure.

2.2.6 Installing Touch Pad Driver for Windows XP

Following is the procedure for installing Synaptics touch pad driver.

1. Click the **Start** button, and then point to **Run** to appear the Run dialog box.
2. Click the **Browse** button to specify the directory as **"E:\Drivers\WinXP\Touch Pad\Setup.exe"**
3. Execute the setup program and then the **Welcome** dialog box appears.
4. Select the language version that you want to install and then click **"OK"** to continue.
5. Click **Next** button several times.
6. Click **Finish** to restart your system.

2.2.7 Installing the Internal Modem for Windows XP

Your notebook computer may come with an optional internal modem. The internal modem is a 56Kps V.90 Askey Data Fax modem.

Installing Internal Modem for Windows XP

1. Boot Windows from your hard disk and insert the disc containing the Modem driver for Windows.
2. Click the **Start** button and then click **Run**. In the Run dialog box, click **Browse** button and navigate to the directory as **"E:\Drivers\WinXP\modem\setup.exe"** where the modem driver is located.

The system may prompt you the message to restart the computer to finish the installation

2.3 System Upgrades

This section provides an easy step in doing system upgrades for your M785 notebook computer.

2.3.1 Jumper Settings

This section provides a jumper setting lists of configuring the notebook.

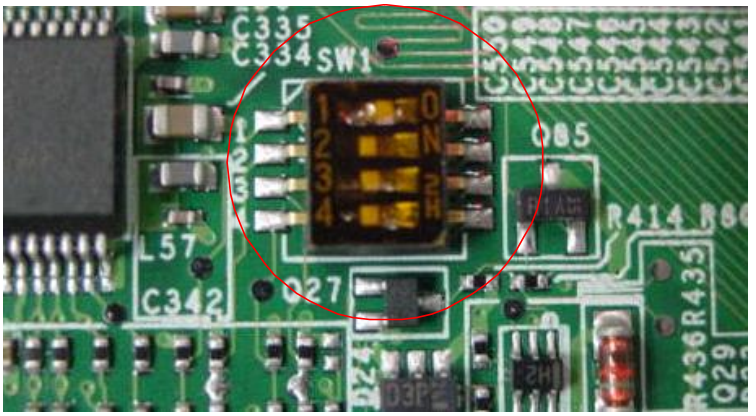


Figure 2-1 Switch 1 Jumper Setting

CPU SPEED , FSB SPEED Select (SW1)

CPU Type	Pin #1	Pin #3,4
2.0G , 2.4G FSB 400MHZ	OFF	ON
2.26G , 2.53G, 2.66G , 2.8G FSB 533MHZ	ON	OFF

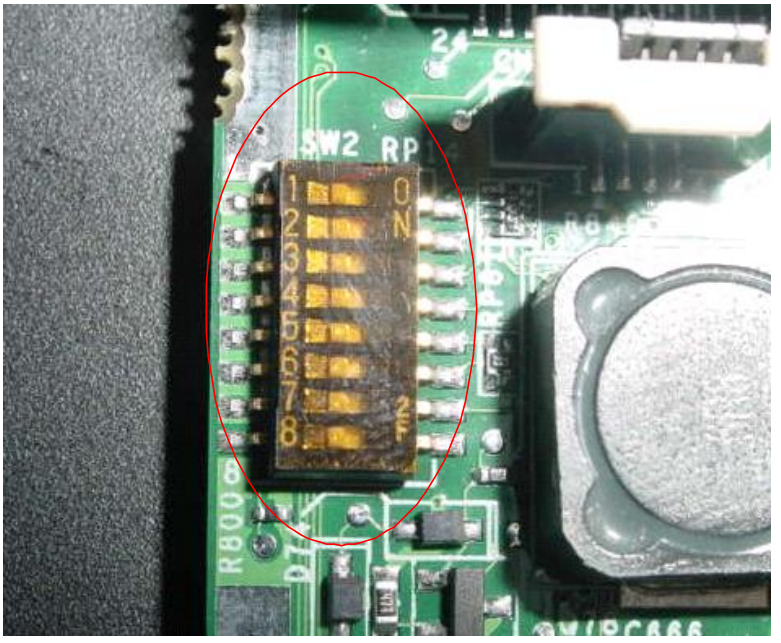


Figure 2-2 Switch 2 Jumper Setting

Password Override (CMOS / RTC Data) Jumper Setting(SW 2)

Password Override	Pin #4
Password Normal	OFF
Clear Password	ON

Main Board ID Select

K/B select	Pin #1	Pin #2
US K/B	OFF	OFF
JP K/B	ON	OFF
Reserved	OFF	ON
UK K/B	ON	ON

CD- ROM

IDE Select	Pin #7
Master	OFF
Slave	ON

CMOS Clear Select

CMOS Reset	Pin #8
Normal	OFF
Clear CMOS	ON

2.3.2 CPU Upgrade Procedure

The M785 features Intel Pentium 4 SFF Processors. It is located on the middle-left side of the system motherboard.

How to upgrade the Intel CPU processor is as follows:

To install or replace the CPU, following the steps as below:

1. Turn off the system and remove both AC adapter and the battery pack from the notebook unit.
2. Remove keyboard cover by gently bending it and sliding it towards in front of you.

Figure 2-3 Remove Keyboard Cover

3. Remove keyboard you can see there are three screws to remove them.

Figure 2-4 Remove Three Screws on the Keyboard

4. Release keyboard cable by sliding the ZIF connector towards upward direction.

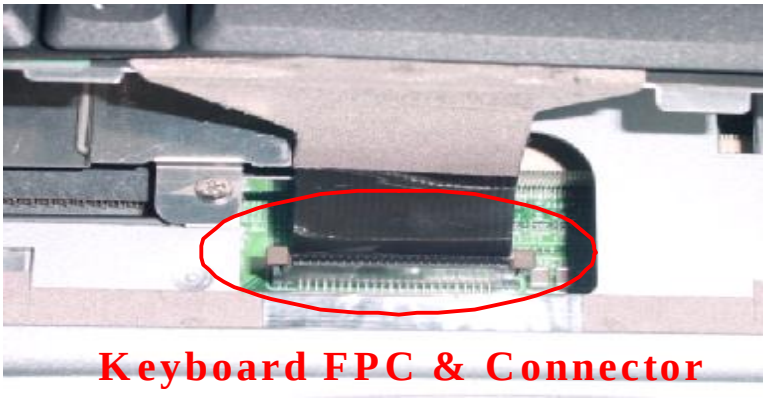


Figure 2-5 Remove the Keyboard FPC

5. There are two screws on the hinge cover and that should be removing as the picture indicated.

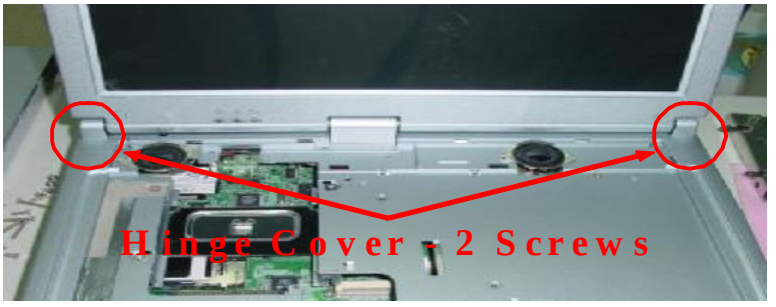


Figure 2-6 Remove the Hinge Cover

6. To release the LED board, there are two screws on the LED board.
7. Please also take out FPC gently from the LED board.

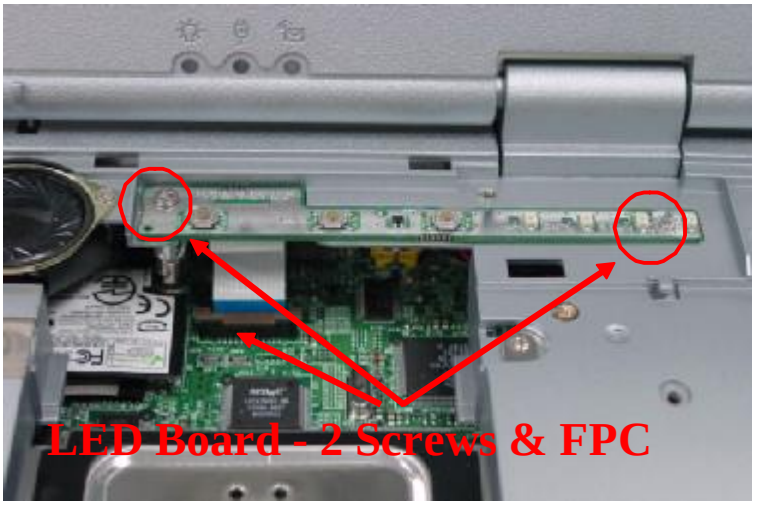


Figure 2-7 Removing the LED Board

8. Please see the location of top cover as the below picture shown.

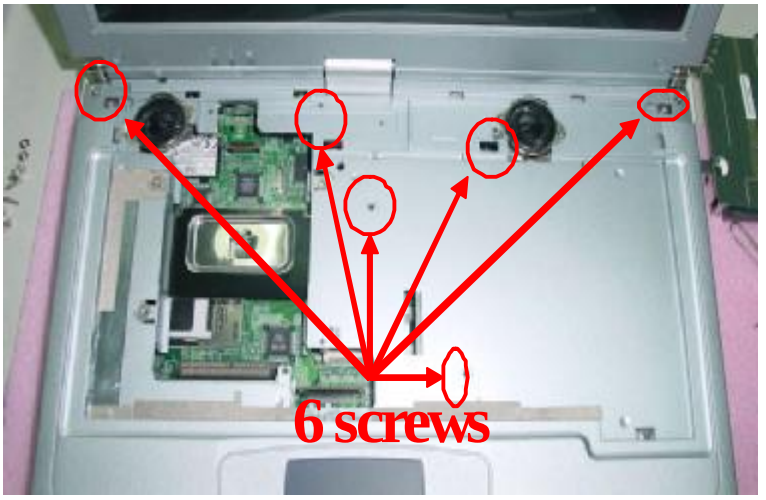


Figure 2-8 Location of Top Cover

9. To remove the top cover, you also need to remove the six screws from the bottom case.

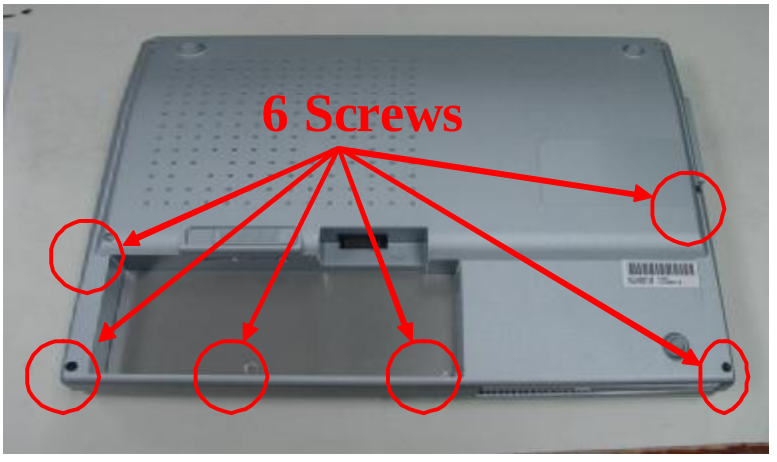


Figure 2-9 Removing the six screws of bottom case

10. There are also four screws from the rear side of this M785 notebook.

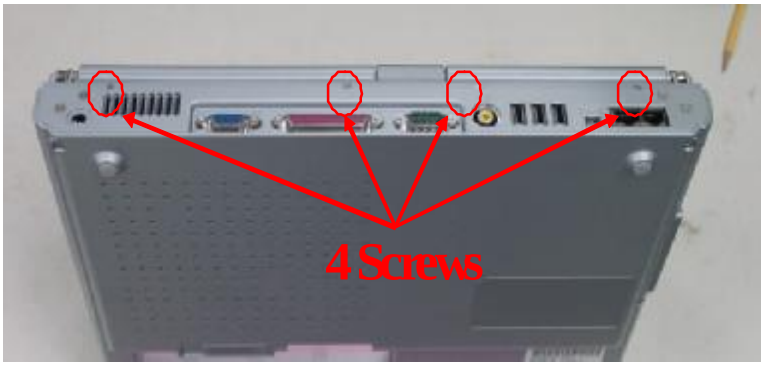


Figure 2-10 Removing the four screws from the rear side

11. Open the top cover and remove G/P from FPC connector

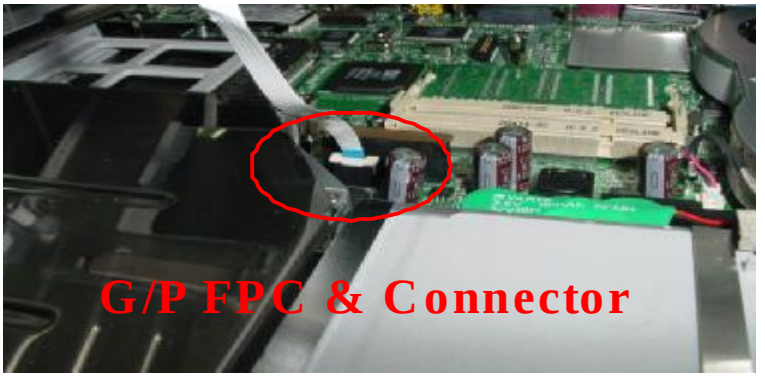


Figure 2-11 Removing the top cover and G/P cable

12. Please make sure there are two connectors for speakers, and that has to be releasing gently as the picture shown.

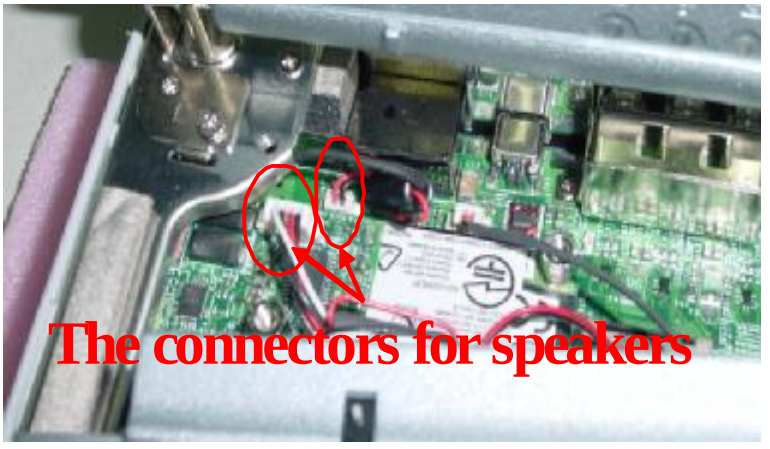


Figure 2-12 Removing the Connectors for Top Cover

13. Removing the heat sink, there are five screws and two fan cables as the picture shown.

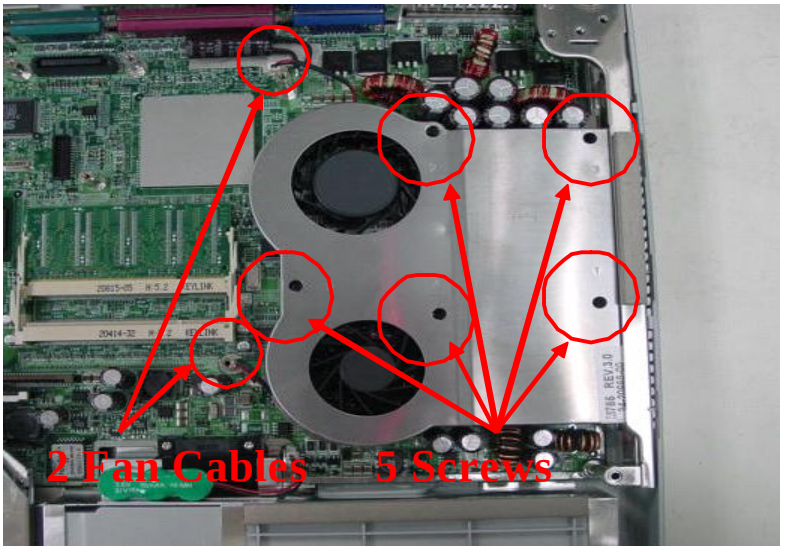


Figure 2-13 Release Heat Sink

14. Using a flat screwdriver, turn the socket lock counter-clockwise direction to unlock CPU from the socket.

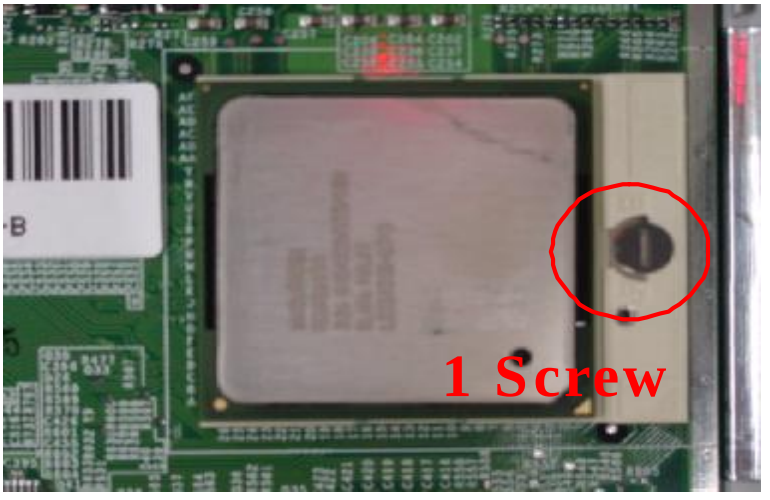


Figure 2-14 CPU Assembly

2.3.5 Memory Upgrade Procedure

The notebook computer offers two 64-bit memory slot using 144-pin SODIMM (Small Outline Dual Inline Memory Module) at 128 / 256 / 512MB DDRRAM. The memory compartment is located on the inside of your computer. The notebook has no memory on-board so you should have at least one SODIMM module inserted.

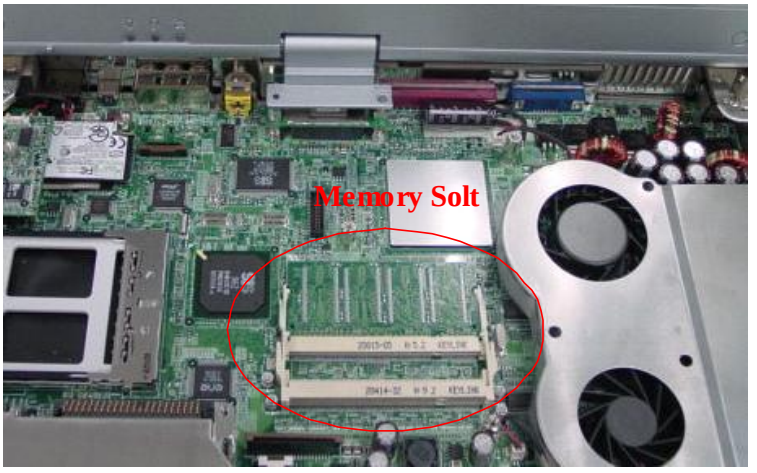


Figure 2-15 Memory Solt

With two memory slots, you can have several combinations up to 1024MB.

Using the Memory Slot inside the computer

Follow the steps below on how to upgrade the memory modules:

1. Make sure the system is powered off and that no peripheral devices are attached.

2. Turn the system over and locate the screw on the memory compartment.

3. Remove the screw and open the memory compartment. Locate the alignment notch on the module.

4. Locate the memory module socket. Align the notch with the notch in the socket connector and insert the module as follows:
   - Hold the SODIMM at a 60-degree angle and align the SODIMM connector with the socket in the system. Push the connector into the socket.
   - Press down on the edge of the SODIMM until the locking tabs on the sides snap into place, securing the module.

5. To remove a SODIMM, press the locking tabs away from the sides of the module until the module pops up. Then, remove the SODIMM.

6. Reassemble the notebook components as follows.
   - Put the DIMM door back.
   - Replace the screw and turn the system over.

2.3.6 Removing the Internal Hard Disk Drive

The notebook provides a built-in hard disk for the primary IDE controller. The HDD is an industry standard 2.5” IDE disk drive with a maximum height of 9.5mm, and can be upgraded with another standard 2.5” HDD with a maximum height of 9.5mm.

1. Find out the built-in hard disk secured with two screw at the right corner of the hard disk. Remove this screw and carefully pull the hard disk module from the connector.

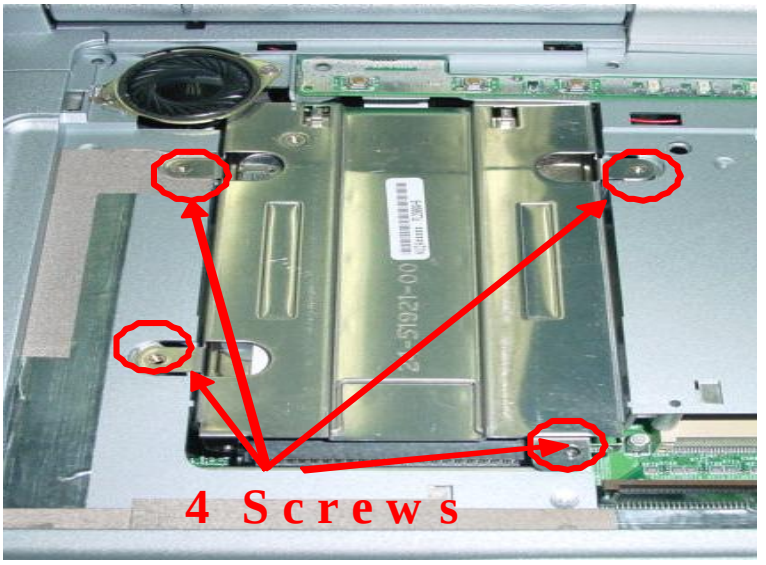


Figure 2-16 Remove Four Screw Securing HDD

2. Remove four screws of frame HDD bracket plate. Two small ones of them are at the front side, and others are at the both sides

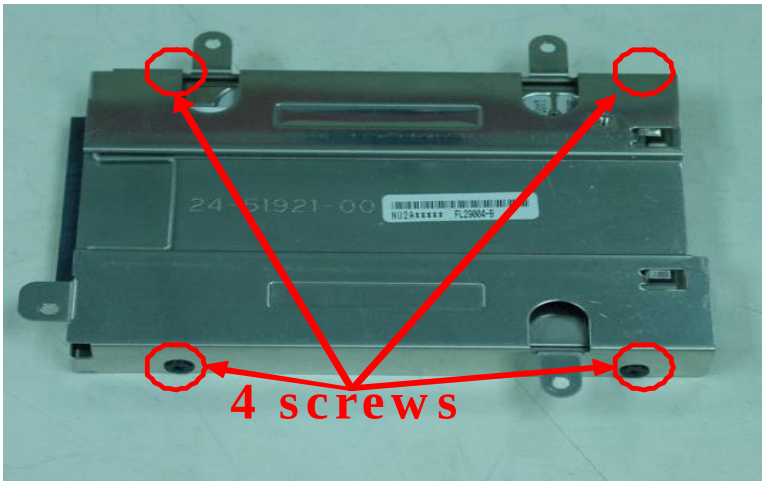


Figure 2-17 Screws Locations of the frame HDD bracket plate

2.3.7 System BIOS Upgrade Procedure

The notebook supports EPROM Flash BIOS that allows you to easily update the system BIOS using the Phoenix BIOS Flash utility program called "**PHLASH.COM**". This program runs under MS-DOS and requires the system not to load high memory like **HIMEM.SYS**. It also needs the "**PLATFORM.BIN**" file in order to activate.

Follow the steps below on how to update the system BIOS:

1. Prepare a clean bootable diskette without loading the HIMEM.SYS. Copy the files **PHLASH.COM** and **PLATFORM.BIN** into the diskette along with the BIOS ROM file.

2. Restart the computer and boot from the diskette. At the DOS prompt, type the command "**PHLASH <*BIOSfile*.ROM>**" to activate Flash BIOS programming utility. The computer will then start to update the system BIOS inside the notebook.

3. After programming is complete, the system will prompt you to press any key to shutdown the computer. The BIOS version is displayed inside the BIOS Setup Main menu. Press <F2> after power on to run CMOS Setup program.

   BIOS Version: 1.0A-0716-0724

i It is very important not to power off the system whenever the FLASH BIOS program is running. Otherwise, the system may not be able to power on and you need to replace the BIOS EPROM chip from another working notebook.

i Always plug in the AC adapter when updating the BIOS.

Chapter 3

Software Functional Overview

3.1 Overview

The M785 is an IBM PC/AT compatible Notebook PC which supports the Intel uFCPGA Socket Pentium IV processor family. The following are the major features that M785 supports.

- § Microsoft PC99 logo and WinXP logo approval.
- § 14.1" XGA / 15.1" XGA, SXGA+ panel support.
- § APM 1.2 compliance
- § Support ACPI 1.0B (or above).
- § Support PCI 2.2 (or above).
- § Support AGP 2.0.
- § Support USB 1.1, 2.0
- § Support SMBIOS 2.3.
- § Support 400/533 Mhz CPU front side bus.

3.2 Summary of the BIOS Specification

Below is the summary of the BIOS software specification:

Controller Chip	Description
BIOS Feature	§ Microsoft PC99 logo and WinXP logo approval. § Support Boot Block / Crisis Rescue. § APM 1.2 Compliance § Support ACPI 1.0B (or above) Spec. § Support PCI 2.1 (or above) Spec. § Support SMBIOS 2.3 Spec § Support AGP 2.0 Spec. § Support, Windows 2000 and Windows XP. § Support flash function including both DOS and Windows interface for new BIOS update. § Support 2 different keyboards on same BIOS. § Support boot from HDD and CDROM Drive.
CPU	Auto detect the CPU type and speed for the Intel Pentium 4 based system
DRAM	Auto sizing and detection. Support PC-200/266 DDR SDRAM.
Cache	§ Level 2 SRAM auto sizing and detection § Always enable CPU L1 and L2 cache.
Shadow	Always enable VGA and System BIOS shadow

Controller Chip	Description
Display	§ System auto detects LCD or CRT presence on boot and lid closed § Support Panning while LCD in a display resolution greater than supported § Support Microsoft Direct 3D § Support AGP 4x BUS
Hard Disk	§ Enhanced IDE spec. § Support auto IDE detection. § Support LBA mode for larger capacity HDD. § Support Ultra DMA 33/66/100. § Support Fast PIO mode 1-4 transfer. § Support 32 bit PIO transfer. § Support Multi-Sector transfer. § Support SMART monitoring.
Multi Boot	Allow the user to select boot from HDD and CD-ROM
Plug and Play	Support PnP Run Time Service and conflict-free allocation of resource during POST
Smart Battery	Support BIOS interface to pass battery information to the application via SMBus.
Keyboard Controller	Support Fn hot keys, two Windows hot keys, built-in Glide Pad and external PS/2 mouse/keyboard
PCMCIA	Compliant with PCMCIA 2.1 specification.
Power Management Support	The power management is compliant with ACPI 1.0B specification and supports the following power state: § S0 (Full-On) Mode § S3 (STR) Mode § S4 (STD) Mode § S5 (Soft-Off) Mode

3.3 Subsystem Software Functions

This section provides introduction on the software functions of the notebook subsystems and BIOS related function.

3.3.1 Key Chipset Summary

Following are the main chipsets used in the notebook:

Controller Chip	Vendor	Description
Processor	Intel	DT Pentium 4 (2.0, 2.2, 2.4, 2.6GHz)
North Bridge	SIS	SIS M650 + SIS 302LV
South Bridge	SIS	SIS 962
Video Controller	SIS	Embedded in SIS M650
PCMCIA Controller	ENE	CB1410
Supper I/O Controller	SMSC	LPC47N267
Audio Controller	SIS	Embedded in SIS 962
Audio Codec	Realtek	ALC201
Keyboard Controller	ENE	ENE KB3886
PMU Controller	Mitsubishi	PMU08
ROM BIOS	SST	49LF040A
IEEE 1394	SIS	Embedded in SIS 962
On board LAN	SIS	Embedded in SIS 962
BlueTooth	Not support	
Modem	MDC	AC'97 S/W Modem

3.3.2 System Memory

The system memory consists of SDRAM memory on 64-bit bus and the module size options are 128/256/512MB upward. The BIOS will automatically detect the amount of memory in the system and configure CMOS accordingly during the POST (Power-On Self Test) process. This must be done in a way that requires no user interaction.

Base SO-DIMM DRAM slot (Bank 0 & 1)	Base SO-DIMM DRAM slot (Bank 2 & 3)	Total Size
NIL	128MB	128MB
NIL	256MB	256MB
NIL	512MB	512MB
128MB	NIL	128MB
128MB	128MB	256MB
128MB	256MB	384MB

128MB	512MB	640MB
256MB	NIL	256MB
256MB	128MB	384MB
256MB	256MB	512MB
256MB	512MB	768MB
512MB	NIL	512MB
512MB	128MB	640MB
512MB	256MB	768MB
512MB	512MB	1024MB

3.3.3 Video

The Video subsystem used External DDR memory of Video memory. The system will support the true ZV port, the Microsoft Direct 3D assist, simultaneous display, monitor sense for auto display on boot and VESA Super VGA function call.

3.3.4 Supported Video Mode

The following is the display modes supported by the SIS Mobility Video control in LCD only, CRT only, and simultaneous mode. The VGA BIOS will allow mode sets of resolutions greater than the panel size but only show as much mode display as will fit on the panel.

- **Supported Standard VGA Mode**

The VGA BIOS supports the IBM VGA Standard 7-bit VGA modes numbers.

Mode	Pixel Resolution	Colors	Memory
00h/01h	40*25	16	Text
02h/03h	80*25	16	Text
04h/05h	320*200	4	2-bit Planar
06h	640*200	2	1-bit Planar
07h	80*25	Mono	Text
0Dh	320*200	16	4-bit Planar
0Eh	640*200	16	4-bit Planar
0Fh	640*350	Mono	1-bit Planar

Mode	Pixel Resolution	Colors	Memory
10h	640*350	16	4-bit Planar
11h	640*480	2	2-bit Planar
12h	640*480	16	4-bit Planar
13h	320*200	256	8-bit Planar

Note: All Standard VGA Modes are limited to the standard VGA refresh rates.

- **Supported extended video modes**

CRT device will support all listed VESA mode; and other devices such as PANEL & TV may be limited to the mode support due to their characteristics

CRT device will support all listed VESA mode; and other devices such as PANEL & TV may be limited to the mode support due to their characteristics.

VESA Mode	Pixel Resolution	Memory Model	Refresh Rates In (Hz)	Minimm Memory
100h	640 x 400	8-bit Packed	70	2MB
101h	640 x 480	8-bit Packed	60, 72, 75, 85	2MB
102h	800 x 600	4-bit Planar	60, 72, 75, 85, 100	2MB
103h	800 x 600	8-bit Packed	60, 72, 75, 85, 100	2MB
104h	1024 x 768	4-bit Planar	43(I), 60, 70, 75, 85, 100	2MB
105h	1024 x 768	8-bit Packed	43(I), 60, 70, 75, 85, 100	2MB
106h	1280 x 1024	4-bit Planar	43(I), 60, 75, 85	2MB
107h	1280 x 1024	8-bit Packed	43(I), 60, 75, 85	2MB
10Eh	320 x 200	16-bit Packed	70	2MB
10Fh	320 x 200	32-bit Unpacked	70	2MB
111h	640 x 480	16-bit Packed	60, 72, 75, 85	2MB
112h	640 x 480	32-bit Unpacked	60, 72, 75, 85	2MB
114h	800 x 600	16-bit Packed	60, 72, 75, 85, 100	2MB
115h	800 x 600	32-bit Unpacked	60, 72, 75, 85, 100	2MB
117h	1024 x 768	16-bit Packed	43(I), 60, 70, 75, 85, 100	2MB
118h	1028 x 768	32-bit Unpacked	43(I), 60, 70, 75, 85, 100	4MB
11Ah	1280 x 1024	16-bit Packed	43(I), 60, 75, 85	4MB
11Bh	1280 x 1024	32-bit Unpacked	43(I), 60, 75, 85	8MB
11Dh	640 x 400	16-bit Packed	70	2MB
11Eh	640 x 400	32-bit Packed	70	2MB
120h	1600 x 1200	8-bit Packed	48(I), 60, 75, 85	2MB
122h	1600 x 1200	16-bit Packed	48(I), 60, 75, 85	4MB
124h	1600 x 1200	32-bit Unpacked	48(I), 60, 75, 85	8MB
12Ah	640 x 480	24-bit Packed	60, 72, 75, 85	2MB
12Bh	800 x 600	24-bit Packed	60, 72, 75, 85, 100	2MB

VESA Mode	Pixel Resolution	Memory Model	Refresh Rates In (Hz)	Minimum Memory
12Ch	1024 x 768	24-bit Packed	43(I), 60, 70, 75, 85, 100	4MB
12Dh	1280 x 1024	24-bit Packed	43(I), 60, 75, 85	4MB
12Eh	320 x 200	8-bit Packed	70	2MB
131h	320 x 200	8-bit Packed	72	2MB
133h	320 x 200	16-bit Packed	72	2MB
134h	320 x 200	32-bit Packed	72	2MB
13Bh*	1400 x 1050	8-bit Packed	60, 75	2MB
13Ch*	1400 x 1050	16-bit Packed	60, 75	4MB
13Eh*	1400 x 1050	32-bitUnpacked	60, 75	8MB
141h	400 x 300	8-bit Packed	72	2MB
143h	400 x 300	16-bit Packed	72	2MB
144h	400 x 300	32-bitUnpacked	72	2MB
151h	512 x 384	8-bit Packed	70	2MB
153h	512 x 384	16-bit Packed	70	2MB
154h	512 x 384	32-bitUnpacked	70	2MB
171h	720 x 480	8-bit Packed	75	2MB
173h	720 x 480	16-bit Packed	75	2MB
174h	720 x 480	24-bit Packed	75	2MB
175h	720 x 480	32-bitUnpacked	75	2MB
176h	720 x 576	8-bit Packed	75	2MB
178h	720 x 576	16-bit Packed	75	2MB
179h	720 x 576	24-bit Packed	75	2MB
17Ah	720 x 576	32-bitUnpacked	75	2MB

Note: "*" The modes may not be available. Their availability should be determined by VESA function calls.

Panel Type Initialization

The VGA BIOS will issue INT 15h function call during POST. This function call allows the system BIOS to specify the panel type to the VGA BIOS. The system BIOS should get the panel type from GPI pins before the VGA chip initialized, and pass this information to VGA BIOS through INT 15 Function code.

- **LCD Panel ID pin Definition:**

GPI[45]	GPI[46]	GPI[10]	GPI[22]	Panel Type
0	0	0	0	
0	0	0	1	
0	0	1	0	
0	0	1	1	
0	1	0	0	
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	LTN141X8-L04 (Samsung)
1	1	0	1	B141XN04V2 (AU)
1	1	1	0	
1	1	1	1	LTN150U1-L02 (Samsung)
				LTN150P3-L04 (Samsung)

3.3.5 Enhanced IDE

The system BIOS must be ready to support 4 IDE devises on two controllers. The BIOS support Ultra DMA33/66/100 and also supports automatic configuration of drives using both the LBA and CHS large drive remapping method. In addition to supporting standard drives through an auto-configuration process that does NOT require user involvement or confirmation. The system should automatically do this at POST time in a way that is transparent to the user. If a drive is connected to the bus, the drive should be automatically recognized, configured and available for use under MS-DOS 6.2x.

3.3.6 Audio

The audio subsystem will support the requirements identified by the AC'97 specification. Both software and hardware will control the volume level for the internal audio subsystem. In addition to the volume control, the user will be able to mute the sound to completely cut off the volume using both software and hardware.

3.3.6 Super I/O

This controller contains 16550A or FIFO Enabled UART, ECP/Standard/Bi-directional Parallel Port meeting the 1284 specification, and an Infrared port that supports IrDA Super IR (4Mbps)

3.3.7 PCMCIA

The PCMCIA controller chip of the notebook provides the following features:

- Support for only single CardBus slot (two type II stacked)
- Individually accessed, dual-buffer implementation
- Support for 3.3v, 5v and 12v (flash programming) cards

3.3.8 LED Indicator

The table below lists down the functions of the Status LED indicator:

Indicator	Function Description
IDE accessing LED	This LED will turn on while accessing the IDE Device.
FDD accessing LED	This LED will turn on while accessing the FDD Device. (M785 No support)
Battery Charging LED	Turn on (Amber) – Battery is under charging mode Turn off – Battery full charged or no battery
CapsLock LED	This LED will turn on when the function of CapsLock is active.
ScrollLock LED	This LED will turn on when the function of ScrollLock is active.
NumLock LED	This LED will turn on when the function of NumLock is active.
Power Status LED	Green – System is powered on. Green Blinking- System is entered suspend mode. Amber – Battery Low.
Mail LED	This LED will turn on while Mail was arrived.
GPRS status	None

i - There LEDs will be turned off during Suspend mode.

3.3.9 Hot Keys Definition

All Hot keys must be active at all times under all operation systems.

- **Hot Keys by Internal Keyboard**

Hot Key	Function	Handler
Fn + F3	Toggle Display (LCD/CRT/LCD&CRT)	BIOS Handler
Fn + F4	System entered into standby mode	BIOS Handler
Fn + F6	System Speaker On/Off	BIOS Handler
Fn + F8	Brightness Increase	Controlled by PMU08
Fn + F9	Brightness Decrease	Controlled by PMU08
ScrLock	Scroll Lock	
Internet Button	Internet Function Key	Controlled by Driver
Mail Button	Mail Function Key	Controlled by Driver

3.3.10 Plug & Play

The BIOS supports the Plug and Play Specification 1.0A. (Include ESCD) This section describes the device management. The system board devices and its resources are as follows:

Device	Connect Type	Resources			
		I/O	IRQ	DMA	Memory
DMA Controller	Static	00~0F, 81~8F	-	DMA4	-
Interrupt Controller	Static	20~21, A0~A1	IRQ2	-	-
System Timer	Static	40~43	IRQ0	-	-
RTC	Static	70~71	IRQ8	-	-
ISA Bus	Static	-	-	-	-
System Speaker	Static	61	-	-	-
System Board	Static	-	-	-	E0000~FFFFF
PnP Mother Board	Static	80	-	-	-
Keyboard Controller	Static	60, 64	IRQ1	-	-
PMU08 Controller	Static	68, 6C	-	-	-
Math Coprocessor	Static	F0~FF	IRQ13	-	-
PS/2 Mouse	Enable / Disable Static	-	IRQ12	-	-
Video Controller	Static	3B0~3BB, 3C0~3DF	IRQ5	-	A0000~BFFFF, C0000~CFFFF
Serial Port	Static	3F8~3FF	IRQ4	-	-
ECP, Parallel port	Dynamic	378~37F, 778~77F	IRQ7	DMA1	-
FDC	Dynamic	3F0~3F5, 3F7	IRQ6	DMA2	-
Dual IDE Controller	Static	170~177, 1F0~1F7, 3F6	IRQ14, 15	-	-
CardBus Controller	Static	3E0~3E1	IRQ11	-	-
Audio chip	Dynamic	220~22F, 300~301, 388~38B	IRQ5	DMA3	-
IEEE1394	Dynamic		IRQ11		
Modem	Dynamic	3E8~3EF	IRQ10	-	-
LAN	Dynamic	1080~10FF	IRQ10	-	-
SIR	Enable / Disable	158~15F, 2F8-2FF	IRQ3	-	-
USB Host Controller	Dynamic	EF80~EF9F	IRQ5	-	-

- **PCI Device**

The table below summarizes the PCI IDSEL Pin Allocation:

IDSEL Pin	PCI Device		
	Device Number	Function Number	Device Name
AD11	Device 00	Function 0	SISM650 - Host to PCI bridge
AD12	Device 01	Function 0	SIS962 – PCI to PCI bridge
AD13	Device 02	Function 0	SIS962 - PCI to ISA bridge
		Function 2	SIS962 - ADSL (Not support)
		Function 3	SIS962 - 1394
		Function 4	SIS962 - PMU and SMBus interface
		Function 5	SIS962 - IDE interface
		Function 6	SIS962 - AC97 Modem interface
		Function 7	SIS962 - AC97 Audio interface
AD14	Device 03	Function 0	SIS962 - USB0
		Function 1	SIS962 - USB1
		Function 2	SIS962 - USB2
		Function 3	SIS962 - USB3
AD15	Device 04	Function 0	SIS962 - LAN
AD23	Device 0C	Function 0	ENE1410 - Card Bus Socket A

The table below summarizes the INT Pin Allocation:

INT Pin	PCI Device
INTA	IDE/
INTB	1394/SMB
INTC	VGA (Embedded in SISM650)/Audio
INTD	USB (Embedded in SIS962)/LAN

The table below summarizes the PCI bus master Allocation:

Arbiter	Signal	Agents (Master)	Function	Use
SIS 962	REQ00/GNT00	SIS962	LAN Controller	
	REQ10/GNT10	CB1410	Card Bus Controller	
	REQ20/GNT20	MDC	MODEM Controller	
	REQ30/GNT30	SIS962	1394 controller	
	REQ40/GNT40	None	None	

3.3.11 MBus Devices

The SMBus is a two-wire interface through which the system can communicate with power-related chips. The BIOS should initialize the SMBus devices during POST.

SIS961 SMBus Connection Devices

SMBus Device	Master/Slave	Address	BIOS Need to Initialization
SIS650 – Core Logic	Both Host and Slave	02h	Enable SMBus interface and SMBus interrupt
SO-DIMM	Slave	A0h	Not Need
ICS952001, ICS93722 CLK Generator	Slave	D2h	Program the desired clock frequency (Pin23 output 24MHz, Pin22 output 48MHz)

PMU 08 SMBus Connection Devices

SMBus Device	Host/Slave	Address A7 ~ A1	BIOS Need to Initialization
PMU08	Master	10h	Enable PS01 decode interface
MAX1617 (Thermal sensor)	Slave	9Ch	Program the desired temperature range
Battery (1st Battery)	Slave	A8h	No Need

3.3.12 Resource Allocation

This section summarizes the resource allocation of the notebook computer.

- **I/O Map**

Hex Address	Device
000 - 01F	8237-1
020 - 021	8259-1
022	SIS 962
040 - 05F	8254
060 - 064	Keyboard Controller
068 – 06C	PMU08 Controller
070 - 07F	RTC & NMI Mask
080 - 08F	DMA Page Registers
092	System Control Port
0A0 - 0A1	8259-2
0B2	Advanced Power Management Control Port
0B3	Advanced Power Management Status Port

Hex Address	Device
0C0 – 0DF	8237-2
0F0 – 0FF	Math Coprocessor
170 – 177	Secondary IDE Controller
1F0 – 1F7	Primary IDE Controller
200 – 20F	Game Port
220 – 22F	Sound Blaster
279	PnP configuration – Address port
330 – 333	MIDI
370 – 371	Sound chip control port
378 – 37A	Parallel Port
388 – 38B	FM Synthesizer
398 – 399	Super I/O Chip
3B0 – 3DF	Video Controller
3E0 – 3E1	PCMCIA Controller
3E8 – 3EF	Fax/Modem
3F0 – 3F7	Floppy Disk Controller
3F8 – 3FF	Serial Port 1
530 – 537	Microsoft Sound System
778 – 77B	ECP port
A79	PnP configuration – Write data port
CF8 – CFC	PCI BUS configuration register

- **ISA DMA Map**

DMA Channel	Device
DMA 0	Unused
DMA 1	ECP
DMA 2	Floppy Disk
DMA 3	Audio
DMA 4	[Cascade]
DMA 5	Unused
DMA 6	Unused
DMA 7	Unused

- **Memory Map**

Address Range	Length	Description
00000 ~ 9FBFFh	640 KB	System Memory
9FC00 ~ 9FFFFh	128 KB	Video Memory
A0000 ~ BFFFFh	40 KB	Video ROM
C0000 ~ CFFFFh	72 KB	Unused

D0000 ~ DFFFFh	16 KB	DMI information
E0000 ~ FFFFFh	128 KB	System ROM BIOS

- **IRQ Map**

IRQ#	Description
IRQ 0	System Timer
IRQ 1	Keyboard
IRQ 2	[Cascade]
IRQ 3	PHS (Serial)
IRQ 4	Serial Port
IRQ 5	Audio/VGA/USB
IRQ 6	Floppy Disk Drive
IRQ 7	Parallel Port
IRQ 8	RTC Alarm
IRQ 9	Reserved for PCMCIA card
IRQ10	LAN / Modem or Combo, (Card Bus), IEEE 1394
IRQ11	ACPI
IRQ12	PS/2 Mouse
IRQ13	FPU (FERR)
IRQ14	Hard Disk Drive
IRQ15	CD-ROM or DVD-ROM

3.4 GPIO Pin Assignment

The GPI and GPO pins connected to system devices. The BIOS can get device's status and control the device via the GPI and GPO pins.

- **SiS650 GPI pin assignment**

GPIO Number	Signal Name	Default	I/O	Notes
GPIO0	LPC_PME0	1	I	0 : LPC_PME0 Event Enable 1 : normal operation
GPIO1	PMUFLASH0	1	O	0 : Flash PMU08 firmware 1 : normal operation
GPIO2	MB_ID0	1	I	0 : Mother Board ID0 Select 1 : normal operation
GPIO3	Q_SMI0	1	I	0 : External K/B SMI0 1 : normal operation
GPIO4	N.C.	--	--	--
GPIO5	N.C			--
GPIO6	N.C.	--	--	--

GPIO Number	Signal Name	Default	I/O	Notes
GPIO7	EC_SCI0	1	I	0 : PMU SCI Detect 1 : PMU SCI Not Detect
GPIO8	PM_RI0	1	I	0 : wakeup event input enable 1 : wakeup event input disable
GPIO9	N.C.	--	--	--
GPIO10	MB_ID1	1	I	0 : Mother Board ID1 Select 1 : normal operation
GPIO11	PM_SLP_S10	1	O	0 : When system into S1 1 : normal operation
GPIO12	STPCPU0	1	O	0 : Stop CPU Clock 1 : normal operation
GPIO13	N.C.	--	--	--
GPIO14	SPDMUX0	1	O	SM BUS Select0
GPIO15	N.C.	--	--	--
GPIO16	N.C.	--	--	--
GPO17	N.C.	--	--	--
GPIO18	SPDMUX1	1	O	SM BUS Select1
GPIO19	ICH_SMBCLK	1	O	SM BUS Clock
GPIO20	ICH_SMBDATA	1	I/O	SM BUS Data

3.4.1 PMU08 GPIO Signal Description

PIN	Signal	I/O	Normal	Runtime / Wake event
GPIOA0	LID#	I	LID Switch	Low = LCD Close.
GPIOA1	N.C.	X		
GPIOA2	Mail LED#	O	Mail LED	Low = Mail Arrival
GPIOA3	QGSMI#	I	ENE KB3886	Low = Keyboard SMI
GPIOA4	PCMUTE#	O		Low = Mute PC speaker
GPIOA5	PSTMSK#	O		Low = PCI Reset Mask, Hi = PCI Reset Enable
GPIOA6	PCMRI#	I	CB1410	Low = Ring Signal from PCMCIA
GPIOA7	RI1#	I	Serial Port	Low = Ring Signal from Serial Port
GPIOB0	N.C.	X		
GPIOB1	N.C	X		
GPIOB2	N.C.	X		
GPIOB3	PDCOM#	O	MAX3243	Low = Power down RS232
GPIOB4	N.C.	X		

PIN	Signal	I/O	Normal	Runtime / Wake event
GPIOB5	N.C.	X		
GPIOB6	PM_SLP_S1#	I	SIS962	Low = POS, STR and STD suspend state
GPIOB7	PM_RI#	O	SIS962	Low = Wake Up Event (SMI or SCI)
GPIOC0	N.C.	X		
GPIOC1	N.C.	X		
GPIOC2	CHGLED	O	Charge LED	High = Turn ON Charge LED
GPIOC3	N.C.	X		

I : INPUT O : OUTPUT L-Lever : Low Lever
H-Lever : Hi Lever Function Pin Description :
A : A-D Converter Input Pin

3.4.2 M3886 GPIO Signal Description

Address	Bit	r/w	Description	Remark
0060h	7:0	r	Read Data from Output Data Bus Buffer	
0060h	7:0	w	Write Data to into Input Data Bus Buffer	
0064h	7:0	r	Status	
0064h	7:0	w	Write Command into Input Data Bus Buffer	

Port Assign:

Port	**Pin Name**	**In/Out**	**Description**
PORT 0	P07 : P00	OUT	Key Scan Data Output
PORT 1	P17 : P10	OUT	Key Scan Data Output
PORT 3	P37 : P30	IN	Key Scan Data Input
PORT 2	P27	OUT	SCROLL Lock LED
	P26	OUT	NUM Lock LED
	P25	OUT	CAPS Lock LED
	P24	OUT	BLEN1
	P23	OUT	Wireless_RFON
	P22	OUT	NC
	P21	IN	PULL DOWN 1K ohm
	P20	OUT	NC
PORT 4	P46	OUT	NC
	P45	OUT	PULL UP 10Kohm
	P44	OUT	PULL UP 10Kohm
	P43	OUT	IRQ12
	P42	OUT	IRQ1
	P41	OUT	NC
	P40	OUT	KBCSMI0

Port	Pin Name	In/Out	Description
PORT 5	P57	OUT	NC
	P56	OUT	NC
	P55	IN	GPRS_PWRENA
	P54	IN	GPRS_VDDPD
	P50	OUT	ISA ADDRESS (SA2)
PORT 6	P61	IN	KBSEL2
	P60	IN	KBSEL1
	P62	IN	GPRS_ON/OFF
	P63	IN	LOGSEL
	P64	OUT	PASS0
	P65	IN	NC
	P66	OUT	BT_FETON1
	P67	OUT	BT_SENSE0
PORT 7	P70	I/O	PS2 DATA
	P73	I/O	PS2 CLOCK
	P72	I/O	EXTERNAL KB DATA
	P75	I/O	EXTERNAL KB CLOCK
	P74	I/O	EXTERNAL MOUSE CLOCK
	P71	I/O	EXTERNAL MOUSE DATA
	P76	I/O	SMDAT_KBC
	P77	I/O	SMCLK_KBC

i I : INPUT O : OUTPUT

3.5 Power Management

This section provides the Power Management software function of the notebook.

3.5.1 General Requirements

The BIOS meet the following general Power Management requirements:

- Compliant with ACPI 1.0B / ACPI 2.0 Specification
- Support for Suspend-to-RAM and Suspend-to-Disk mode
- Support for Resume on External Modem Ring while in S3 Mode
- Support for Resume on Internal Modem Ring while in S3 / S4 Mode
- Support for LAN Remote Power while in S3 / S4 Mode
- Power Management must not substantially affect or degrade system performance
- Power Management must be OS independent
- Support resume on Time/Date
- Support Wireless LAN wake up
- Support Internet / Mail button wake up

3.5.2 System Power Plane

The system components are grouped as the following parties to let the system to control the On/Off of power under different power management modes.
The power plane is divided as following:

Power Group	Power Control Pin	Controlled Devices
+B	Nil	IMM, (9V~20V)
+3VA	Nil	SIS962 (RTC I/F), Internal Modem Ring, PMU08
+12V	PWRON	PCMCIA Card, AC97 Codec
+5V	PWRON	PCMCIA Slot 5V
+3V	PWRON	VGA, PCMCIA, PCMCIA Slot 3V, DRAM, Twister(DRAM I/F), ENE KB3886, MAX3243
+5VS	SUSB#	FLASH ROM, HDD, CD-ROM, USB, Internal K/B, Glide Pad, External P/S2 Mouse, Audio AMP, Fan
+3VS	SUSB#	SIS962 (ISA I/F Power), Clock Generator & Buffer (W137)
+RTCVCCS	Nil	SIS962 (RTC)

3.5.3 Power Management Mode

- **Full On Mode**

The system state where no devices are power managed and the system can respond to applications with maximum performance.

- **Doze mode**

The CPU clock is slow down and all other devices are full-on.

- **Stand by mode**

A suspend state where all motherboard components are still powered-on except for the system clock generator device. The PCI and CPU buses are driven to the inactive idle state. The system memory is powered and refreshed by the memory bridge, and the graphics frame buffer is powered and refreshed by the graphic chip. The system provides a 32Khz clock (SUSCLK) in this suspend mode to support refresh of these memory subsystems. Only an enabled "resume event" can bring the system out of the stand by state. The SIS 961 also provides a resume timer that allows the system to resume after a programmed time has elapsed.

- **Suspend to RAM mode (STR)**

A suspend state where all motherboard components are powered-off. The CPU/L2 and PCI busses are powered off. All devices connected to the CPU/L2 and PCI busses must either be powered-off or isolate their bus interfaces. The system memory is powered and refreshed by the memory bridge, and the graphics frame buffer is powered and refreshed by the graphics chip. The system provides a 32 kHz clock (SUSCLK) in this suspend mode to support refresh of these memory subsystems. Only an enabled "resume event" can bring the platform out of the suspend to RAM (STR) state.

- **Suspend to Disk mode (STD)**

A suspend state where the context of the entire system is saved to disk, all motherboard components are powered-off, and all clocks are stopped. Any enabled "resume event", such as PowerBTN or RTC, can bring the platform out of the suspend to disk (STD) state.

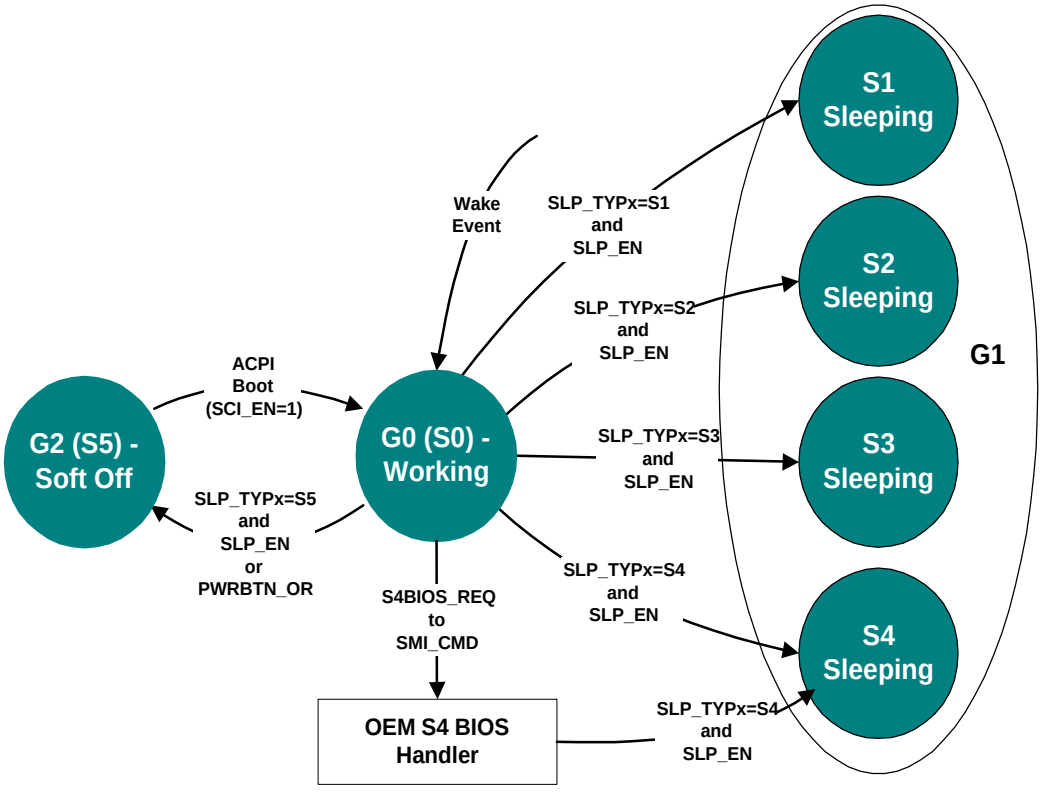
- **Soft off mode (SOFF)**

The This is the same as suspend to disk except the context of memory is not saved. The system will resume from Soft Off as if a hard reset had occurred.

- **Mechanical off mode**

All power except the RTC has been removed from the system.

3.5.4 Power Management Mode Transition Flow



3.5.5 Power Management Mode Transition Event

The following table summarizes the entry events and wake-up events of each power

Power State	Entry Event	Wake up Event
S1	OSPM control Lid Close	Power Button Ring Indicator Battery Low - Low RTC Alarm LAN Wake Up
S4	OSPM control, STD hot key pressed Lid Close Battery Low – Low	Power Button RTC Alarm
S5	Power Button Execute Windows shutdown command	Power Button RTC Alarm

3.5.6 Lid Switch

The function of Lid Switch is depends on the ACPI aware OS

3.5.7 Power button and suspend button

The function of Lid Switch is depends on the ACPI aware OS.

3.5.8 Device Power management

- **Power state of local devices table**

PowerState / Component	Doze	Stand By	STR	STD/SOff
CPU	Stop Grant	Stop Clock	Power Off	Power Off
L2 CACHE	ON	Power Down	Power Off	Power Off
SISM650	ON	Stop Clock	Power Off (except Vcc)	Power Off
SIS962	ON	ON	Power Off (except SUSVcc, RTCVcc)	Power Off (except SUSVcc, RTCVcc)
DRAM	ON	Self Refresh	Self Refresh	Power Off
Clock Synthesizer	ON	Low Power	Power Off	Power Off
CDROM	ON	Power Down	Power Off	Power Off
HDD	ON	Power Down	Power Off	Power Off
FDD (M785 None)	ON	Power Down	Power Off	Power Off
KBC	ON	ON	Power Down	Power Off

PMU08	ON	ON	Power Down	Power Down
VGA/VRAM	ON	Power Down	Power Down	Power Off
PCMCIA	ON	Power Down	Power Down	Power Off
Super I/O	ON	Power Down	Power Off	Power Off
AUDIO	ON	Power Down	Power Off	Power Off
Audio AMP	ON	Power Down	Power Off	Power Off
LCD Backlight	ON	Power Off	Power Off	Power Off
Serial Port	ON	Power Down	Power Down	Power Off
IR Module	ON	Power Down	Power Off	Power Off
LAN	ON	Power Down	Power Down	Power Down
Internal Modem	ON	Power Down	Power Down	Power Down

- **Device PM control during Stand By mode**

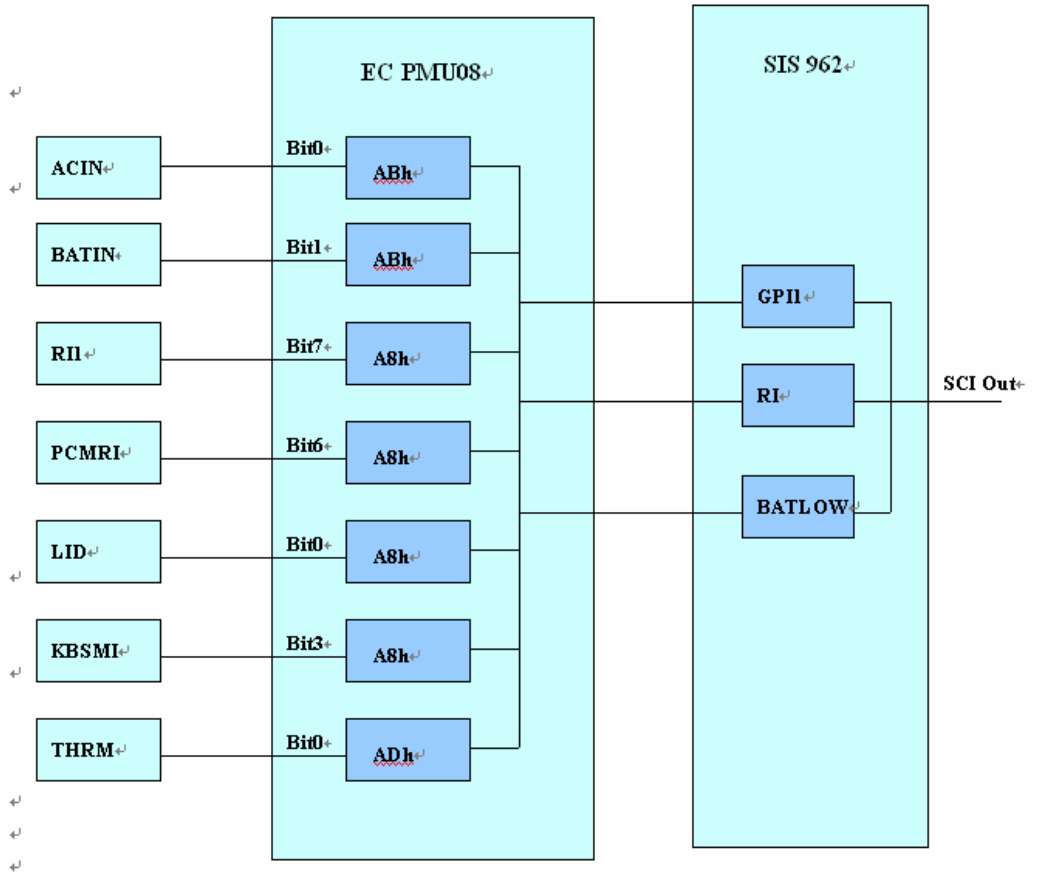
Device	Power Controlled by	Description
CPU	Hardware	Controlled by SUS_STAT1# pin
L2 CACHE	Hardware	Controlled by BIOS
SISM650	Hardware	Controlled by SUS_STAT1# pin
SIS962	Working	
DRAM	Hardware	Self Refresh
Clock Synthesizer	Hardware	Controlled by SUSA# pin
CDROM	Software	CDROM support power down command
HDD	Software	HDD support power down command
FDD (M785 Not support)	Software	FDD support power down command
KBC	Working	
VGA/VRAM	Software	Controlled by SISM650
PCMCIA	Software	Controlled by Driver enter Dx status
Super I/O	Software	Controlled by SIS962
AUDIO	Software	Controlled by SIS962
Audio AMP	Software	Controlled by BIOS
LCD Backlight	Hardware	Controlled by VGA chip
Serial Port	Software	Controlled by PMU08 GPIO[B3] pin
IR Module	Software	IR module support power down command
LAN	Software	LAN support power down command
Internal Modem	Software	Modem support power down command

- **Device PM control during STR mode**

Device	Power Down Controlled by	Description
CPU	Hardware	Controlled by SUSB# pin
L2 CACHE	Hardware	Power off
SIS962	Hardware	Controlled by SUSB# pin
DRAM	Software	Self Refresh
Clock Synthesizer	Hardware	Controlled by SUSB# pin
CDROM	Hardware	Power off
HDD	Hardware	Power off
FDD (M785 Not support)	Hardware	Power off
KBC	Software	Controlled by ENE KB3886 power down command
PMU08	Sofeware	Controlled by PMU08 power down command
VGA/VRAM	Software	Controlled by SISM650
PCMCIA	Software	Controlled by SUSB# pin
Super I/O	Hardware	Controlled by SIS962
AUDIO	Hardware	Controlled by SIS962
Audio AMP	Hardware	Controlled by BIOS
LCD Backlight	Hardware	Power off
Serial Port	Software	Controlled by PMU08 GPIO[B3] pin
IR Module	Hardware	Controlled by SUSB# pin
LAN	Hardware	Controlled by Driver enter Dx status
Internal Modem	Hardware	Controlled by Driver enter Dx ststus

3.6.1 Expanding Event Through the Embedded Controller

The following figure shows the relationships between the devices that are wired to the embedded controller, the embedded controller queries, and ACPI general



l SCI Source and Query Event from M38867

PMU08	Input Event	GPE Event	Handler
ADPIN#	AC Plug In/Out	GPI1	AML Handler
BAT0#	Battery Plug In/Out	GPI1	AML Handler
GPIOA0	LID Event	RI	AML Handler
GPIOA3	Keyboard SMI	RI	AML Handler
GPIOA6	PCMCIA Ring In	RI	AML Handler
GPIOA7	COM Port Ring In	RI	AML Handler
THRM	Thermal Event	GPI1	AML Handler

The system will issue a beep to inform user while the following SCI alerted:

- § AC (AC status change) update battery information.
- § BAT (Battery status change) update battery information.
- § Lid (Lid close/open event) update Lid position status.
- § RI10 COM Port Ring Event
- § PCMRI10 PCMCIA Ring Event
- § THRM0 (Thermal event) update thermal level information

l Control Method Battery Subsystem

EC should support all the battery information to ACPI-OS

- Designed Battery capacity
- Designed Voltage
- Designed Low battery capacity
- Designed Low – Low battery capacity
- Latest Full charged capacity
- Present Remaining capacity
- Present drain rate
- Present voltage
- Present Battery Status

ACPI BIOS should support an independent device object in the name space, and implement the following methods.

3.6.2 Thermal Control

There are three primary cooling policies that the OS use to control the thermal state of the hardware.

Cooling Policy	Action	Temperature Setting
Action cooling	Fan On	Always On
Action cooling	Fan High On	Over 55^{o}C
	Fan High Off	Below 50^{o}C
Passive cooling	Throttling CPU On	Over 70^{o}C
	Throttling CPU Off	Below 60^{o}C
Critical trip point	System Shutdown	Over 80^{o}C

ACPI allows OS to be proactive in its system cooling policies. With OS in control of the operating environment, cooling decisions can be made based on application load on the CPU and the thermal heuristics of the system. Graceful shutdown of OS at critical heat levels becomes possible as well. The following sections describe the thermal objects available to OS to control platform temperature. ACPI expects all temperatures to be given in tenths of Kelvin.

The ACPI thermal design is based around regions called *thermal zones.* Generally, the entire PC is one large thermal zone, but an OEM can partition the system into several thermal zones if necessary.

l Active, Passive, and Critical Policies

There are three primary cooling policies that the OS uses to control the thermal state of the hardware. The policies are *Active, Passive* and *Critical:*

- **Passive cooling:** The OS reduces the power consumption of the system to reduce the thermal output of the machine by slowing the processor clock. The _PSV control method is used to declare the temperature to start passive cooling.
- **Active cooling:** The OS takes a direct action such as turning on a fan. The _AC*x* control methods declare the temperatures to start different active cooling levels.
- **Critical trip point:** This is the threshold temperature at which the OS performs an orderly, but critical, shut down of the system. The _CRT object declares the critical temperature at which the OS must perform a critical shutdown.

When a thermal zone appears, the OS runs control methods to retrieve the three temperature points at which it executes the cooling policy. When the OS receives a thermal SCI it will run the _TMP control method, which returns the current temperature of the thermal zone. The OS checks the current temperature against the thermal event temperatures. If _TMP is greater than or equal to _AC*x* then the OS will turn on the associated active cooling device(s). If _TMP is greater than or equal to _PSV then the OS will perform CPU throttling. Finally if _TMP is greater than or equal to _CRT then the OS will shutdown the system.

An optimally designed system that uses several SCI events can notify the OS of thermal increase or decrease by raising an interrupt every several degrees. This enables the OS to

anticipate _AC*x*, PSV, or _CRT events and incorporate heuristics to better manage the systems temperature.The operating system can request that the hardware change the priority of active cooling vs passive cooling.

l Dynamically Changing Cooling Temperatures

An OEM can reset _ACx and _PSV and notify the OS to reevaluate the control methods to retrieve the new temperature settings. The following three causes are the primary uses for this thermal notification:

- When a user changes from one cooling mode to the other.
- When a swappable bay device is inserted or removed. A swappable bay is a slot that can accommodate several different devices that have identical form factors, such as a CD-ROM drive, disk drive, and so on. Many mobile PCs have this concept already in place.
- When the temperature reaches an _AC*x* or the _PSV policy settings

In each situation, the OEM-provided AML code must execute a **Notify** (*thermal_zone*, 0x80) statement to request the OS to re-evaluate each policy temperature by running the _PSV and _AC*x* control methods.

n Resetting Cooling Temperatures from the User Interface

When the user employs the UI to change from one cooling mode to the other, the following occurs:

1. The OS notifies the hardware of the new cooling mode by running the Set Cooling Policy (_SCP) control method.
2. When the hardware receives the notification, it can set a new temperature for both cooling policies and notify the OS that the thermal zone policy temperatures have changed.
3. The OS re-evaluates _PSV and _ACx.

n Resetting Cooling Temperatures to Adjust to Bay Device Insertion or Removal

The hardware can adjust the thermal zone temperature to accommodate the maximum operating temperature of a bay device as necessary. For example,

1. Hardware detects that a device was inserted into or removed from the bay and resets the _PSV and/or _AC*x* and then notifies the OS of the thermal and device insertion events.
2. The OS reenumerates the devices and reevaluates _PSV and _ACx.

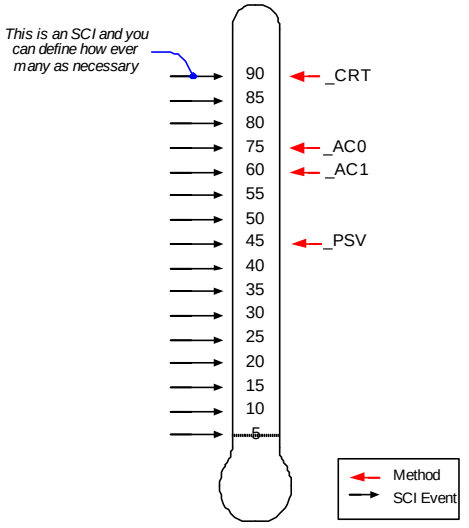
n Resetting Cooling Temperatures to Implement Hysteresis

An OEM can build hysteresis into platform thermal design by dynamically resetting cooling temperatures. For example,

1. When the heat increases to the temperature designated by _AC*x*, the OS will turn on the associated active cooling device and the hardware will reset the AC*x* value to a lower temperature.
2. The hardware will then run the Notify command and the OS will reevaluate the new temperatures. Because of the lower _AC*x* value now, the fan will be turned off at a lower temperature than when turned on.
3. When the temperature hits the lower _AC*x* value, the OS will turn off the fan and reevaluate the control methods when notified.

3.6.3 Hardware Thermal Events

An ACPI-compatible OS expects the hardware to generate a thermal event notification through the use of the SCI. When the OS receives the SCI event, it will run the _TMP control method to evaluate the current temperature. Then the OS will compare the value to the cooling policy temperatures. If the temperature has crossed over one of the three policy thresholds, then the OS will actively or passively cool (or stop cooling) the system, or shutdown the system entirely.



Both the number of SCI events to be implemented and the granularity of the temperature separation between each SCI event is OEM-specific. However, it is important to note that since the OS can use heuristic knowledge to help cool the system, the more events the OS receives the better understanding it will have of the system thermal characteristic.

3.6.4 Active Cooling Strength

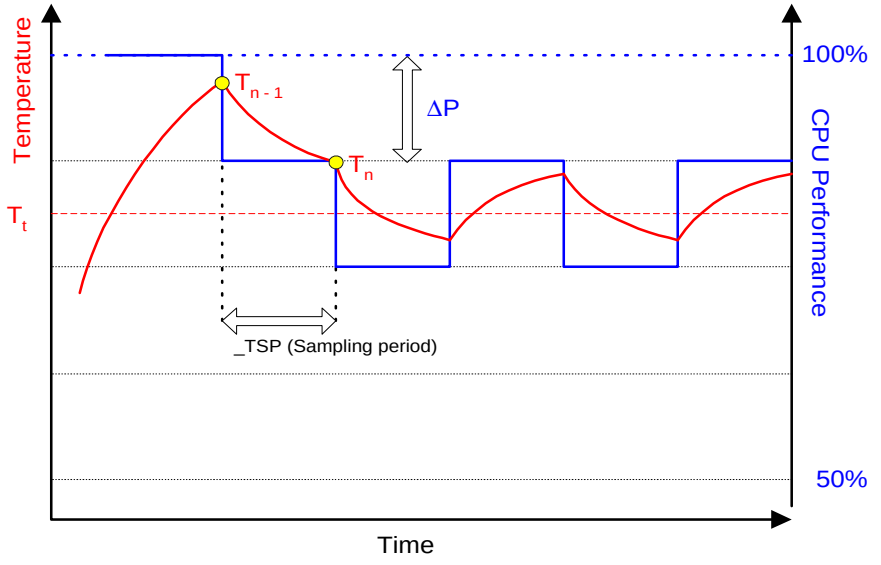
The Active cooling methods (_Ac*x*) in conjunction with active cooling lists (_AL*x*), allows an OEM to use a device that offers varying degrees of cooling capability or multiple cooling devices. The _AC*x* method designates the temperature at which the Active cooling is enabled or disabled (depending upon the direction in which the temperature is changing). The _AL*x* method evaluates to a list of devices that actively cool the zone. For example:

- If a standard single-speed fan is the Active cooling device, then the policy is represented by the temperature to which _AC0 evaluates, and the fan is listed in _AL0.

- If the zone uses two independently-controlled single-speed fans to regulate the temperature, then _AC0 will evaluate to the maximum cooling temperature using two fans, and _AC1 will evaluate to the standard cooling temperature using one fan.
- If a zone has a single fan with a low speed and a high speed, the _AC0 will evaluate to the temperature associated with running the fan at high-speed, and _AC1 will evaluate to the temperature associated with running the fan at low speed. _AL0 and _AL1 will both point to different device objects associated with the same physical fan, but control the fan at different speeds.

3.6.5 Passive Cooling Equation

Unlike the case for _AC*x*, during passive cooling the OS takes the initiative to actively monitor the temperature in order to cool the platform. On an ACPI-compatible platform that properly implements CPU throttling, the temperature transitions will be similar to the following figure.



For the OS to assess the optimum CPU performance change required to bring the temperature down, the following equation must be incorporated into the OS.

ΔP [%] = _TC1 * (Tn - Tn-1) + _TC2 * (Tn - Tt)

where

Tn = current temperature

Tt = target temperature (_PSV)

The two coefficients _TC1 and _TC2 and the sampling period _TSP are hardware-dependent constants the OEM must supply to the OS (for more information, see section 12.3). The object _TSP contains a time interval that the OS uses to poll the hardware to sample the temperature. Whenever _TSP time has elapsed, the OS will run _TMP to sample the current temperature (shown as Tn in the above equation). Then the OS will use the sampled temperature and _PSV (which is the target temperature Tt) to evaluate the equation for ΔP. The granularity of ΔP is determined by the CPU duty width of the system. A detailed explanation of this thermal feedback equation is beyond the scope of this specification.

3.6.6 Critical Shutdown

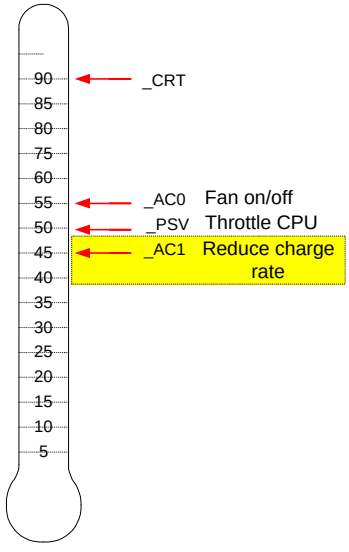
When the heat reaches the temperature indicated by _CRT, the OS must immediately shutdown the system. The system must disable the power either after the temperature reaches some hardware-determined level above _CRT or after a predetermined time has passed. Before disabling power, platform designers should incorporate some time that allows the OS to run its critical shutdown operation. There is no requirement for a minimum shutdown operation window that commences immediately after the temperature reaches _CRT. This is because

- Heat might rise rapidly in some systems and slower on others, depending on casing design and environmental factors.
- Shutdown can take several minutes on a server and only a few short seconds on a hand-held device.

Because of this indistinct discrepancy and the fact that a critical heat situation is a remarkably rare occurrence, ACPI does not specify a target window for a safe shutdown. It is entirely up to the OEM to build in a safe buffer that it sees fit for the target platform.

3.6.7 Other Implementation of Thermal Controllable Devices

The ACPI thermal event model is flexible enough to accommodate control of almost any system device capable of controlling heat. For example, if a mobile PC requires the battery charger to reduce the charging rate in order to reduce heat it can be seamlessly implemented as an ACPI cooling device. Associating the charger as an active cooling device and reporting to the OS target temperatures that will enable or disable the power resource to the device do this. Figure as following illustrates the implementation. Because the example does not create noise, this will be an implementation of *silence* mode.



3.6.8 Thermal Control Methods

Control methods and objects related to thermal management are listed in the table below.

Object	Description
_AC*x*	Returns Active trip point in tenths Kelvin
_AL*x*	List of pointers to active cooling device objects
_CRT	Returns critical trip point in tenths Kelvin
_PSL	List of pointers to passive cooling device objects
_PSV	Returns Passive trip point in tenths Kelvin
_SCP	Sets user cooling policy (Active or Passive)
_TC1	Thermal constant for Passive cooling
_TC2	Thermal constant for Passive cooling
_TMP	Returns current temperature in tenths Kelvin
_TSP	Thermal sampling period for Passive cooling in tenths of seconds

- **_AC*x***

This control method returns the temperature at which the OS must start or stop Active cooling, where *x* is a value between 0 and 9 that designates multiple active cooling levels of the thermal zone. If the Active cooling device has one cooling level (that is, n") then that cooling level is named _AC0. If the cooling device has two levels of capability, such as a high fan speed and a low fan speed, then they are named _AC0 and _AC1 respectively. The smaller the value of *x*, the greater the cooling strength _AC*x* represents. In the above example, _AC0 represents the greater level of cooling (the faster fan speed) and _AC1 represents the lesser level of cooling (the slower fan speed). For every AC*x* method, there must be a matching AL*x* method.

Arguments: None.

Result Code: Temperature in tenths Kelvin

The result code is an integer value that describes up to 0.1 precisions in Kelvin. For example, 300.0K are represented by the integer 3000.

- **_AL*x***

This object evaluates to a list of Active cooling devices to be turned on when the associated _ACx trip point is exceeded. For example, these devices could be fans.

- **_CRT**

This control method returns the critical temperature at which the OS must shutdown the system.

Arguments: None.

Result Code: Temperature in tenths Kelvin

The result is an integer value that describes up to 0.1 precisions in Kelvin. For example,

300.0K are represented by the integer 3000.

_PSL

This object evaluates to a list of processor objects to be used for Passive cooling.

_PSV

This control method returns the temperature at which the OS must activate CPU throttling.

Arguments: None.

Result Code: Temperature in tenths Kelvin.

The result code is an integer value that describes up to 0.1 precision in Kelvin. For example, 300.0 Kelvin is represented by 3000.

_SCP

This control method notifies the hardware of the current user cooling mode setting. The hardware can use this as a trigger to reassign _AC*x* and _PSV temperatures. The operating system will automatically evaluate _ACx and _PSV objects after executing _SCP.

Arguments: 0 - Active; 1 - Passive

Result Code: None.

_TC1

This is a thermal object that evaluates to the constant _ TC1 for use in the Passive cooling formula:

ΔPerformance [%]= _TC2 * (Tn - Tn-1) + _TC1 * (Tn. - Tt)

_TC2

This is a thermal object that evaluates to the constant _TC2 for use in the Passive cooling formula:

ΔPerformance [%]= _TC2 * (Tn - Tn-1) + _TC1 *.(Tn. - Tt)

_TMP

This control method returns the thermal zone current operating temperature in Kelvin.

Argument: None.

Result Code: Temperature in tenths Kelvin.

The result is an integer value that describes up to 0.1 precision in Kelvin. For example, 300.0K is represented by the integer 3000.

_TSP

This is an object that evaluates to a thermal sampling period used by the OS to implement the Passive cooling equation. This value, along with _TC1 and _TC2, will enable the OS to provide the proper hysteresis required by the system to accomplish an effective passive cooling policy. The granularity of the sampling period is 0.1second. For example, if the sampling period is 30.0 seconds, then _TSP needs to report 300; if the sampling period is 0.5 seconds, then it will report 5. The OS can normalize the sampling over a longer period if necessary.

3.6.9 AC Adapters and Power Source Objects

The Power Source objects describe the power source used to run the system.

Object	Description
_PSR	Returns present power source device
_PCL	List of pointers to powered devices.

l _PSR

Returns the current power source devices. Used for the AC adapter and is located under the AC adapter object in name space. Used to determine if system is running off the AC adapter.
Arguments: None
Results code: **0x00000000** = Off-line; **0x00000001** = On-line

l _PCL

This object evaluates to a list of pointers, each pointing to a device or a bus powered by the power source device. Pointing a bus means that all devices under the bus is powered by it power source device.

3.7 Battery Management

This notebook supports only Li-Ion Battery Pack. There is only one battery pack activating at one time. The special designed Bridge Battery module can backup the system under Suspend To RAM mode for a short period of time.

3.7.1 Battery Sub-system

§ The charger will stop charge the battery when the following condition is detected.
- The temperature of the system is too high
- The remaining capacity is 95% and more.

Note that the battery life is depend on different configuration running. E.g. with CD-ROM battery life is shorter, document keyin only battery life is longer, PMU disable battery life is short, PMU enable battery life is longer.

- Battery reading methodology is through PMU08 SMBus.

-

3.7.2 Battery Low Warning

When the battery voltage is approaching to the Low level, the PMU08 will generate a battery low SMI. The system will do the following action.

1) The Power Indicator will become blinking.
2) The system will issue a Warning beep.

3.7.3 Battery Low

When the battery voltage is approaching to the Low-Low level, the PMU08 will generate a battery low-low SMI. The system will do the following action.

1) The Power Indicator will keep on Blinking.
2) The system will enter Suspend To Disk mode even the power management is disabled. The function of power-on or Resume will be inhibited until the battery Low – Low condition is removed.

3.7.4 AC Adapter

When plug in the AC adapter, the system will do the following action:
- The charger will charge the Main Battery, if remaining capacity is not full.
- The Battery Charging Indicator will turn on if the battery is in changing mode.

3.8 PMU08

The embedded controller PMU08 acts as a supplement for power management control. It supports a lot of functions via SMBus interface.

3.8.1 The System EC RAM With PMU08

Embedded Controller Command Set
The EC I/F command set allows the OS to communicate with the PMU08.
For detail information refer to ACPI 1.0B specification.

EC I/F Command	Command Byte Encoding	Byte	Register	R / W	Description	Interrupt
Read Embedded Controller (RD_EC)	0x80	#1	EC_SC	W	Command byte Header	Interrupt on IBF=0
		#2	EC_DATA	W	Address byte to read	No Interrupt
		#3	EC_DATA	R	Read data to host	Interrupt on OBF=1
Write Embedded Controller (WR_EC)	0x81	#1	EC_SC	W	Command byte Header	Interrupt on IBF=0
		#2	EC_DATA	W	Address byte to write	Interrupt on IBF=0
		#3	EC_DATA	W	Data to write	Interrupt on IBF=0
Burst Enable Embedded Controller (BE_EC)	0x82	#1	EC_SC	W	Command byte Header	No Interrupt
		#2	EC_DATA	R	Burst acknowledge byte	Interrupt on OBF=1
Burst Disable Embedded Controller (BD_EC)	0x83	#1	EC_SC	W	Command byte Header	Interrupt on IBF=0
Query Embedded Controller (QR_EC)	0x84	#1	EC_SC	W	Command byte Header	No Interrupt
		#2	EC_DATA	R	Query value to host	Interrupt on OBF=1

3.8.2 PMU08 EC RAM List

The micro controller PMU08 acts as a supplement for power management control. It supports the following functions via SMBus Command **(0x80 , 0xC0)**

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	Default	Description
1st Battery [_BIF]	00h *3	Power unit	R(/W)	DATA[15:0] *1								-	0xffff	0x0000: mWh [Fixed value] 0xffff: Unknown
	02h *3	Design capacity	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	04h *3	Last Full Charge Capacity	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	06h *3	Battery Technology	R(/W)	DATA[15:0] *1								-	0xffff	0x0000 : Primary 0x0001: Secondary [Fixed value] 0xffff: Unknown.
	08h *3	Design Voltage	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mV) 0xffff: Unknown
	0Ah *3	Design capacity of Warning	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	0Ch *3	Design capacity of Low	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	0Eh *3	Battery capacity Granularity 1	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	10h *3	Battery capacity Granularity 2	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	12h *3	Model number	R(/W)	DATA[15:0] *1								-	0xffff	0x0000 [Not support]
	14h *3	Serial Number	R(/W)	DATA[15:0] *1								-	0xffff	0x0000 [Not support]
	16h *3	Battery type	R(/W)	DATA[15:8] *1 All bits are 0								-	0xffff	CELL_TYPE [3:0] This code depends on battery data format. In the future, this code may be added. 0x00: NiMH 0x01: Li-ion 0x10: Non-rechargeable battery (Reserved)
	18h *3	OEM Information	R(/W)	DATA [15:8] *1 All bits are 0								-	0xffff	Vender [7:0] This code depends on battery data format. And the following name should be described in the ASL with the same character code. In the future, these codes will be added. 0: “MoliEnergy” 1: “Panasonic” 2: (SANYO does not agree the vender name display) 3: “TBCL” (Toshiba) 4: “Sony”

*1: The register type is word.
*3: This register is not cleared if the system is in S4-S5 state.
R(/W): This is the read only register, but the written data will be able to read back till PMU updates the data periodically, or PMU detects the status change.

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	Default	Description
1st Battery [_BST]	1Ah *3	Battery State	R(/W)	DATA[15:3] *1 All bits are 0					CRIT	CHG	DCHG	-	-	DCHG=1: The battery is discharged CHG =1 : The battery is charged CRIT =1 : The battery is critical (Empty)
	1Ch *3	Battery Present rate	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mW) 0xffff: Unknown
	1Eh *3	Battery Remaining Capacity	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	20h *3	Battery present Voltage	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mV) 0xffff: Unknown
1st Battery [_BTP]	22h	Battery Trip Point	R/W	DATA[15:0] *1								-	0x0000	0x0000 :Clear the trip point 0x0001-0xffff(mWh)
2nd Battery [_BIF]	24h to 3Ch *3	*2	*2	*2								*2	*2	*2
2nd Battery [_BST]	3Eh to 44h *3	*2	*2	*2								*2	*2	*2
2nd Battery [_BTP]	46h	*2	*2	*2								*2	*2	*2
-	48h	Battery data Size	R(/W)	DATA[7:0]								-	-	0x01 : DATA size is 3byte.(PMU06A) 0x00 :DATA size is 2 byte. (PMU06) *8
1st Battery [_BIF]	49h	Design capacity	R(/W)	DATA[23:16] *1 *7								-	0xff	PMU06A use this data with 02/03h. *7 *8
	4Ah	Last Full Charge Capacity	R(/W)	DATA[23:16] *1 *7								-	0xff	PMU06A use this data with 04/05h. *7 *8
1st Battery [_BST]	4Bh	Battery Remaining Capacity	R(/W)	DATA[23:16] *1 *7								-	0xff	PMU06A use this data with 1E/1Fh. *7 *8
1st Battery [_BTP]	4Ch	Battery Trip Point	R(/W)	DATA[23:16] *1 *7								-	0x00	PMU06A use this data with 22/23h. *7 *8
2nd Battery [_BIF]	4Dh	Design capacity	R(/W)	DATA[23:16] *1 *7								-	0xff	PMU06A use this data with 26/27h. *7 *8
	4Eh	Last Full Charge Capacity	R/(/W)	DATA[23:16] *1 *7								-	0xff	PMU06A use this data with 28/29h. *7 *8
2nd Battery [_BST]	4Fh	Battery Remaing Capacity	R(/W)	DATA[23:16] *1 *7								-	0xff	PMU06A use this data with 42/43h. *7 *8
2nd Battery [_BTP]	50h	Battery Trip Point	R(/W)	DATA[23:16] *1 *7									0x00	PMU06A use this data with 46/47h. *7 *8
	51h to 6Bh *3	Reserved	R/W	Don't care								-	-	

*1: The register type is word.
*2: Same as 1st Battery CMBatt Data
*3: This register is not cleared if the system is in S4-S5 state.
R(/W): This is the read only register, but the written data will be able to read back till PMU updates the data periodically, or PMU detects the status change.

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	Default	Description
PMU Access	6Ch	PMU_LOW_ ADR	R/W	DATA [7:0]								-	-	These registers are available when PMU slave mode or charger mode is selected. For detail information, refer to PMU slave communication section in this document
	6Dh	PMU_HIG_ ADR	R/W	DATA [15:8]								-	-	
	6Eh	CHECK_ SUM	R/W	DATA [7:0]								-	-	
	6Fh	PMU_DATA	R/W	DATA [7:0]								-	-	
SMBus	70h *7	SMB_PTCL	R/W	PROTOCOL[7:0]								-	-	For detail information, refer to ACPI 1.0 specification [13.9 SMBus Host controller Interface via Embedded controller] These registers are not available when PMU slave mode or charger mode is selected. The PMU06 has access protect function for the EEPROM in the battery, to cancel the protection, set the access protect cancel bit. For detail, refer to SMBus section
	71h *7	SMB_STS	R/W	DONE	ALRM	RES	STATUS [4:0]					-	-	
	72h	SMB_ADDR	R/W	ADDRESS [6:0]							RES	-	-	
	73h	SMB_CMD	R/W	COMMAND								-	-	
	74h to 93h	SMB_DATA [0-31]	R/W	DATA								-	-	
	94h	SMB_BCNT	R/W	RES[7:5]			BCNT[4:0]					-	-	
	95h	SMB_ ALARM_ ADDR	R(/W)	ADDRESS[6:0]							RES	-	-	
	96h to 97h	AMB_ ALARM_ DATA[0-1]	R(/W)	DATA								-	-	
	98h	SMB_CNRL	R/W	RES[7:1]							PRT		0x00	PRT =1 : The SMBus address (A8-AE) protection is cancelled.
Reserved	99h to 9Fh	Reserved	R/W	Don't care								-	-	

*7: When this register is checked by polling, the interval time is necessary more than 500usec.
R(/W): This is the read only register, but the written data will be able to read back till PMU updates the data periodically, or PMU detects the status change.

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	De-fault	Description
Status	A0h *3	ADP_STS	R(/W)	RES[7:1]							CON	-	-	CON = 1 : AC adapter is connected
	A1h *3	BAT1_STS (1st Battery)	R(/W)	BTP	EMP	LOW	WAR	ERR	DCHG	CHG	CON	-	-	BTP =1: Battery trip point is detected. EMP =1: Battery is empty. LOW =1: Battery is Low battery WAR=1: Battery is warning state. ERR =1: Battery is Warning state. DCHG=1: Battery is Error state. CHG=1: Battery is discharged. CON=1: Battery is charged. Battery is connected.
	A2h *3	BAT2_STS (2nd Battery)	R(/W)									-	-	
	A3h *3	Reserved	R/W	Don't care								-	-	
	A4h *3	BAT1_CAP	R(/W)	BCAP								-	-	0x00-0x64 = 0-100(%) 0x7F = Unknown 0x80 = Not installed
	A5h *3	BAT2_CAP	R(/W)	BCAP								-	-	
	A6h *3	Reserved	R/W	Don't care								-	-	
	A7h	SMB_Alert_ ADDR	R/W	ADDRESS[6:0]							RES	-	0x00	SMBAlert output device address The alert response function is available when this register is cleared (0x00) only. When the several devices assert the alert signal at the same time, the least address is stored to this register. And when this register is cleared , next alert address is stored to this register.
	A8h *5	GPIO-A_ EVT_STS	R/W	STS_A [7:0]								Read 0:No event 1:EVT detection Write 0:Clear event 1:Ignore	0x00	To clear the notified event flag without unexpected event loss, clear the corresponding bit flag only. For this operation, this register has special writing manner as follows. STS_X ß (STS_X) AND (Written data)
	A9h *5	GPIO-B_ EVT_STS	R/W	0	STS_B [6:0]								0x00	
	AAh *5	GPIO-C_ EVT_STS	R/W	0	0	0	0	0	0	STS_C [1:0]			0x00	
	ABh *5	RUN_ EVT_STS	R/W	BTP2	SMB	ALRT	GPIO	RES	BAT2	BAT1	ADP	Read 0:No event 1:EVT detection Write 0:Clear event 1:Ignore	0x00	BTP2 =1: BTP2 event is detected SMB =1 : SMBus event is detected. ALRT=1 : SMBAlert is detected. GPIO =1 : GPIO event is detected. BATn=1 : Battery event is detected. ADP =1 : Battery event is detected. TH =1 : Thermal event is detected HIGH=1 : High alarm point is detected. LOW =1 : Low alarm point is detected. ERR =1 : Polling communication failure with retry.
	ACh *5	WAKE_ EVT_STS	R/W										0x00	
	ADh *5	RUN_ EVT_STS_2	R/W	Reserved [7:1]							TH		0x00	To clear the notified event flag without unexpected event loss, clear the corresponding bit flag only. For this operation, this register has special writing manner as follows. STS_X ß (STS_X) AND (Written data)
	AEh *5	WAKE EVT_STS_2	R/W	Reserved [7:1]							TH		0x00	
	AFh *5	THERMAL_ EVT_STS	R/W	Reserved [7:3]					ERR	LOW	HIGH		0x00	

*3: This register is not cleared if the system is in S4-S5 state.
*5: After writing to this register, Set the "00h" to the BURST_FLG_CLR register.

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	De-fault	Description
Event/ GPIO Control	B0h	EC_RUN_ ENB	R/W	BTP2	SMB	ALRT	RES[4:1]				ADP	0: Disable 1: Enable	0x00	BTP2: BTP2 event SMB : SMBus event. ALRT: SMBAlert event. ADP: Adapter event.
	B1h	EC_WAKE_ ENB	R/W									0: Disable 1: Enable	0x00	
	B2h	BATT_RUN_ ENB	R/W	BTP	EMP	LOW	WAR	ERR	CAP	C/D	CON	0: Disable 1: Enable	0x00	BTP: Battery trip point EMP: Empty. LOW: Low battery WAR: Warning ERR: Error CAP: Capacity learning C/D: Charge/Discharge CON: Battery presence
	B3h	BATT_WAKE _ENB	R/W									0: Disable 1: Enable	0x00	
	B4h	GPIO-A_ IO_CONF	R/W	CONF_A [7:0]								0: Input 1: Output	0x00	For detail information, refer to GPIO section in this document.
	B5h	GPIO-A_ DATA	R/W	DATA_A [7:0]									-	
	B6h	GPIO-A_ RUN_ENB	R/W	RUN_ENB_A [7:0]								0: Disable 1: Enable	0x00	
	B7h	GPIO-A_ EVT_POL	R/W	POL_A [7:0]								0: Falling edge 1: Rising edge	0x00	
	B8h	GPIO-A_ WAKE_ENB	R/W	WAKE_ENB_A [7:0]								0: Disable 1: Enable	0x00	
	B9h	GPIO-B_ IO_CONF	R/W	1	CONF_B [6:0]							0: Input 1: Output	0x80	
	BAh	GPIO-B_ DATA	R/W	0	DATA_B [6:0]								-	
	BBh	GPIO-B_ RUN_ENB	R/W	0	RUN_ENB_B [6:0]							0: Disable 1: Enable	0x00	
	BCh	GPIO-B_ EVT_POL	R/W	0	POL_B [6:0]							0: Falling edge 1: Rising edge	0x00	
	BDh	GPIO-B_ WAKE_ENB	R/W	0	WAKE_ENB_B [6:0]							0: Disable 1: Enable	0x00	
	BEh	GPIO-C_ DATA	R/W	RES [7 :4] *4				DATA_C [3:0]					-	
	BFh	GPIO-C_ RUN_ENB	R/W	0	0	0	0	0	0	RUN_ ENB_ C [1:0]		0: Disable 1: Enable	0x00	

*4: Should be 0.

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	De-fault	Description	
Event/ GPIO Control	C0h	GPIO-C_ EVT_POL	R/W	0	0	0	0	0	0	POL_C [1:0]		0: Falling edge 1: Rising edge	0x00		
	C1h	GPIO-C_ WAKE_ENB	R/W	0	0	0	0	0	0	WAKE_ ENB_C [1:0]		0: Disable 1: Enable	0x00		
	C2h	EVT_CONT	R/W	RES [7:6]		WAKE	SCI	RES *4	Q_RUN	WAKE_OUT	SUS_X		0x00	WAKE SCI Q_RUN WAKE_OUT SUS_X	=0: Wake# output is “Level”. =1: Wake# output is “Pulse”. =0: SCI is always output by event detection and SCI_EVT shows the query data is stored. And next SCI is not output until SCI_EVT is cleared. =1: SCI is output when the command set is not executed and OBF=0. SCI_EVT shows the output SCI is for event notification. =0: Runtime event ststus is reflected to RUN_EVT_STS register. =1: Runtime event status is reflected to Query data. =0: Wake event output is always enable.(in S0-S3) =1: Wake event output is enable when SUS_X=L. =0: Runtime and Wakeup is selected by SUS_B. (GPIO B6 is enable) =1: Runtime and Wakeup is selected by SUS_A. (GPIO B6 is used as SUS_A input.)
	C3h	EC_RUN_ ENB_2	R/W	Reserved [7:1]							TH	0: Disable 1: Enable	0x00	TH: Thermal event	
	C4h	EC_WAKE_ ENB_2	R/W									0: Disable 1: Enable	0x00		
	C5h To C7h	Reserved	R/W	Don’t care								-	-		
	C8h *6	GPI_AD0	R	AD0_DATA [7:0]								-	-	For detail information, refer to GPIO section in this document.	
	C9h *6	GPI_AD1	R	AD1_DATA [7:0]								-	-		
	CAh *6	Reserved	R/W	Don’t care								-	-		
	CBh	D/A_CONT	R/W	DATA [7:0]								-	0xff	0x00-0xfe: D/A converter output data 0xff : Battery capacity(%) output	
	CCh	WAKE_DIS	R/W	DATA [7:0]								-	0x00	0x00 : WAKE# output enable 0x01 : WAKE# output disable	

*4: Should be 0.
*6: This register’s response time is 150usec max.

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	De-fault	Description
Battery control	D0h	BAT_CHG_CONT	R/W	RES[7:5]			CHG_RDY#	RES [3:2]		CHG2	CHG1	-	-	CHG_RDY# =0 : Charge ready CHGn =1 : The nth battery is charged
	D1h	BAT_DCH_PRI	R/W	RES[7:3]					PAT [2:0]			-	0x00	Battery discharge priority 0 : 2 1 1 : 1 2 2 : 2 1 3 : 2 1 4 : 1 2 5 : 1 2 6 : Same as 0 7 : Simultaneously discharge (Read only :This data can be set using PMU register)
	D2h	BAT_DCH_CONT	R/W	RES[7:2]						DCHG2	DCHG1	0: Not discharge 1: Discharge	-	The discharge battery can be selected one of the batteries can be discharged.
	D3h	BAT_WAR_ABS	R/W	DATA[15:0] *1								-	0x0000	Absolute capacity battery Warning detection point 0x0000-0xffff (mWh)
	D5h	BAT_LOW_ABS	R/W	DATA[15:0] *1								-	0x0000	Absolute capacity battery Low detection point 0x0000-0xffff (mWh)
	D7h	BAT_WAR_REL	R/W	DATA [7:0]								-	0x10	Relative capacity battery Warning detection point 00-C8h (0-100% step 0.5%)
	D8h	BAT_LOW_REL	R/W	DATA [7:0]								-	0x06	Relative capacity battery Low detection point 00-C8h (0-100% step 0.5%)
	D9h *3	FULL_DATA	R/W	DATA [7:0]								-	0xbe	Full charge cancel point 00-C8h (0-100% step 0.5%)
	Dah	CC_CUR_DATA	R	DATA [7:0]								-	0x00	Battery charging current setting 0x01-0xff (0.02-5.10A step 0.02A) 0x00 Depends on the battery This register is “read only”, to change the value, use the register in PMU registers area.
	DBh To DCh	BTP2	R/W	DATA [15:0]								-	0x0000	0x0000: Clear the trip point 0x0001-0xffff : (mWh) When all of the battery’s capacities lesser than this setting value, the BTP2 is detected if event is enabled.
	DDh To DFh	Reserved	R/W	Don't care								-	-	

*3: This register is not cleared if the system is in S4-S5 state.
R(/W): This is the read only register, but the written data will be able to read back till PMU updates the data periodically, or PMU detects the status change.

Function	Address	Register Name	R/W	Bit Number 7	6	5	4	3	2	1	0	Logic	De-fault	Description
PMU control	E0h	PMU_CONT	R/W	RES[7:3]					EC_REG	BAY_LED	POW_LED	-	0x00	EC_REG =1 PMU does not initialize E register when system power is off. BAY_LED =1: PMU indicates the Battery discharge status to the LED_BAY#n, when the battery is installed. POW_LED =1: The Power LED blink
	E1h	ACPI_ACC_ ENB	R/W	RES [7:1]							OS_STS	-	0x00	OS_STS = 1: ACPI mode = 0: Legacy mode
	E2h	OFF_TIME	R/W	DATA [7:0]								-	0x64	Power switch over ride function timer 01h-FFh (0.1-25.5esc step 0.1sec) 00h : Reserved
Thermal Sensor Polling	E3h	POLLING_ ADDRESS	R/W	Slave Address [6:0]							RES		0x00	Address: 0x00-0x7F The polling slave address setting If this address is 00, the Polling is disabled.
	E4h	HIGH_ ALARM	R/W	DATA [7:0]								Signed value	0x00	If the received data GE this value, the event will be detected.
	E5h	LOW_ ALARM	R/W	DATA [7:0]								Signed value	0x00	If the received data LE this value, the event will be detected.
	E6h	POLLING_ INTERVAL	R/W	DATA [7:0]									0x00	0x00 :Polling disable 0x01 – 0xFF [x 250ms] (250ms to 63.75sec)
	E7h	POLLING_ DATA	R(/W)	DATA [7:0]								Signed value	0x00	This register shows data at latest polling.
	E8h	HARDWARE_ SHUT_DOWN	R/W	DATA [7:0]								Signed value	0x7D	If the thermal sensor read value GE this value, the PMU automatically off the power.
	E9h	POLLING_ COMMAND	R/W	DATA [7:0]									0x00	Polling command (data register) address.
	EAh	RETRY_ COUNT	R/W	DATA [7:0]									0x10	0x00 - 0xFF: Retry count value (0-255)
	EBh To EFh	Reserved	R/W	Don't care										
PMU control	F0h	BURST_FLG_ CLR	R/W	DATA [7:0]								-	-	After writing to the register addressed A8h-AFh, Set the 00h to this register.
	F1h To FFh	Reserved	R/W	Don't care										

R(/W): This is the read only register, but the written data will be able to read back till PMU updates the data periodically, or PMU detects the status change.

3.9 Miscellaneous

3.9.1 Power Button

The system may have different action upon pressing the Power Button when the system is in the different state.

System Power State	Action for Pressing Power Button
Full-on	Power Off
Stand by	Power Off
STR	Resume from STR
STD	Resume from STD
SOff/MOff	Power On

3.9.2 Security

The user may enter up to 8 standard text characters for a password. The password includes two levels. The higher priority is the Supervisor Password. The lower priority is the User Password. The Supervisor Password can access all the system resource, while the User Password may not access the floppy disk when it is protected by Supervisor Password. Also, the User Password may not access the floppy disk when the Supervisor Password protects it.

When the security function is enabled, the system will request the user to enter password during the following situation:

- Power On → The system will prompt the user to enter the password before booting the OS. If the user key in the wrong password for 3 times, then the system will halt.

- Resume → The system will prompt the user to enter password while resuming from STR or STD mode. If the user keys in the wrong password for 3 times, the system will not resume and should return to Suspend mode.

- Entering CMOS Setup → The system will prompt the user to enter the password before entering the CMOS Setup. If the user keys in the wrong password for 3 times, then the system will halt.

3.10 CMOS Setup Utility

The Setup utility is used to configure the system. The Setup contains the information regarding the hardware for boot purpose. The changed settings will take effect after the system rebooted. Refer to Chapter 1 on running BIOS Setup Program for more detailed information.

3.11 Definitions of Terms

10Base-T (Ethernet) - A networking standard that supports data transfer rates up to 10Mbps (10 megabits per second).

100Base-T (Fast Ethernet) - A relatively new networking standard that supports data transfer rates up to 100Mbps.

ACPI - Advanced Configuration and Power Management Interface, a power management specification developed by Intel, Microsoft, and Toshiba.

CardBus - The 32-bit version of the PCMCIA PC Card standard. In addition to

supporting a wider bus (32 bits instead of 16 bits), CardBus also supports bus mastering and operation speeds up to 33MHz.

Clock Throttling – South bridge function that allows the CPU clock to be stopped and started at a known duty cycle using the STPCLK# pin to enter and exit Stop Grant mode. Clock throttling is used for power saving, thermal management, and reducing the processing speed.

DIMM (SODIMM) - Dual In-line Memory Module, a small circuit board that holds memory chips. A Single In-line Memory Module (SIMM) has a 32-bit path to the memory chips whereas a DIMM has 64-bit path. Because the Pentium processor requires a 64-bit path to memory, you need to install SIMMs two at a time. With DIMMs, you can install one DIMM at a time. SODIMM is Small Outline Dual In-line Memory Module used in notebook computers.

DMI - Desktop Management Interface, an API to enable software to collect information about a computer environment about a computer environment. For example, using DMI a program can determine what hardware and expansion boards are installed on a computer.

GPI - General Purpose Input.

GPO - General Purpose Output.

Lid Switch - A switch that indicates the notebook LCD Panel has been closed and it can be turned off.

MPEG-2 - Moving Picture Experts Group, a working group of ISO. The term also refers to the family of digital video compression standards developed by the group. There are two major MPEG standards : MPEG-1 and MPEG-2. The most common implementations of the MPEG-1 standard provide a video resolution 352x240 at 30 frames per second(fps). A newer standard, MPEG-2, offers resolution of 720x480 and 1280x720 at 60 fps, with full CD-quality audio.

North Bridge - The CPU to PCI interface, also contains the memory and cache controllers.

South Bridge - The PCI to ISA interface, also contains many legacy devices.

SMM - System Management Mode, Mode of operation while an SMI is active.

SMI - System Management Interrupt, non-maskable interrupt that causes the system to enter SMM. SMM functions include power management, USB legacy keyboard control, security, hot keys, and thermal monitoring.

SMB - System Management Bus, that is used for managing smart batteries, reading SDRAM configuration information, and other miscel1aneous system function.

TBD -To Be Discussed. The mentioned specification is not final that should be discussed with related engineers.

Ultra DMA-33 - A protocol developed by Quantum Corporation and Intel that supports burst mode data transfer rates of 33.3 MBps.

USB - A new external bus standard that supports data transfer rates of 12 MBps. A single USB port can be used to connect up to 127 peripheral devices, such as mice, modems, and keyboards. USB also supports Plug-and-Play installation and hot plugging.

Chapter 4

Hardware Functional Overview

4.1 Overview

The FIC M785 notebook consists of several important functions and subsystems including:

- System Processor – implemented on the motherboard using the Intel uFCPGA DT Pentium 4 Northwood at 400/533 MHz Front System Bus speed.
- System North Bridge Core Logic – implemented on the motherboard using the SIS 650 chipset.
  - CPU Interface
  - AGP BUS Controller
  - DDR DRAM Controller
  - MuTIOL Media I/O
- System South Bridge Core Logic – implemented on the motherboard using the SIS 962 chipset.
  - Integrated MuTIOL Connect to PCI Bridge
  - Dual IDE Master/Slave Controller, Integrated DMA
- Clock Frequency Generator – implemented on the motherboard using the ICS 952001 clock generator chip.
- Cache Memory Subsystem – implemented on-die on the Intel CPU.
  - L1 cache (Pentium Processor Internal)
    - 12KB code and 8KB data, which implemented 8 way set associative and write back
  - L2 cache (Pentium Processor Internal)
    - 256KB Advanced Transfer Cache,8 way associativity
    - 8-way set associative, 32-byte line size, 1 line per sector
- Video Subsystem – embedded in SIS 650
  - High Performance and high quality 3D accelerator
  - Integrated VB bridge
  - High performance 2D accelerator
  - Complete TV-OUT/Digital Flat Panel Solution
- VRAM – embedded in SIS 650
  - Share system memory from 8MB up to 64MB
- PCMCIA Subsystem – implemented on the motherboard using the ENE CB1410 PCI-CARDBUS BRIDGE controller chip.
  - Support Type II x2 (without door)
- Sound – implemented or integrated in south bridge (SIS 962)
  - AC'97 CODEC
  - Realtek ALC201

  - AC'97 Revision 2.1 Compliant
- USB and Bluetooth – implemented or integrated in south bridge (SIS 962)
  - USB v2.0 and Intel Universal HCI v.1.1 Compatible
  - Eighteen level (doublewords) data FIFO with full scatter and gather capability
  - Root hub and four function ports
  - Integrated physical layer transceivers with optional over-current detection status on USB inputs
  - Legacy keyboard and PS/2 mouse support
- Keyboard and Pointing Device Subsystem – implemented on the motherboard using the Keyboard assembly, and the Glidepad assembly.
- I/O Subsystem – implement included on the SIS 962.
- RTC + NVRAM – integrated in south bridge (SIS 962)
  - Real Time Clock with 256 byte extend CMOS
  - IBM AT Clock/ Calendar/ Alarm (14 Bytes)
- Internal Modem /LAN
  - MDC Modem
    - V.90, K56flex, ITU-T V.34, V.32, RJ11 Jack
    - TIA/EIA 602, V.42
    - ITU-T V.17, V.29, V.27ter, V.21 Ch2
    - TIA/EIA 578 Class1 FAX
    - Wake up on Ring
  - LAN (ICS)
    - Support for auto-negotiation (10BASE-T and 100BASE-TX)
    - Wake up On LAN

- Power Subsystem – implemented on the motherboard, LCD Inverter Board, Battery Pack, and AC adapter.
- Micro-P Subsystem – embedded controller on the motherboard using Mitsubishi PMU08

4.2 System Hardware Block Diagram

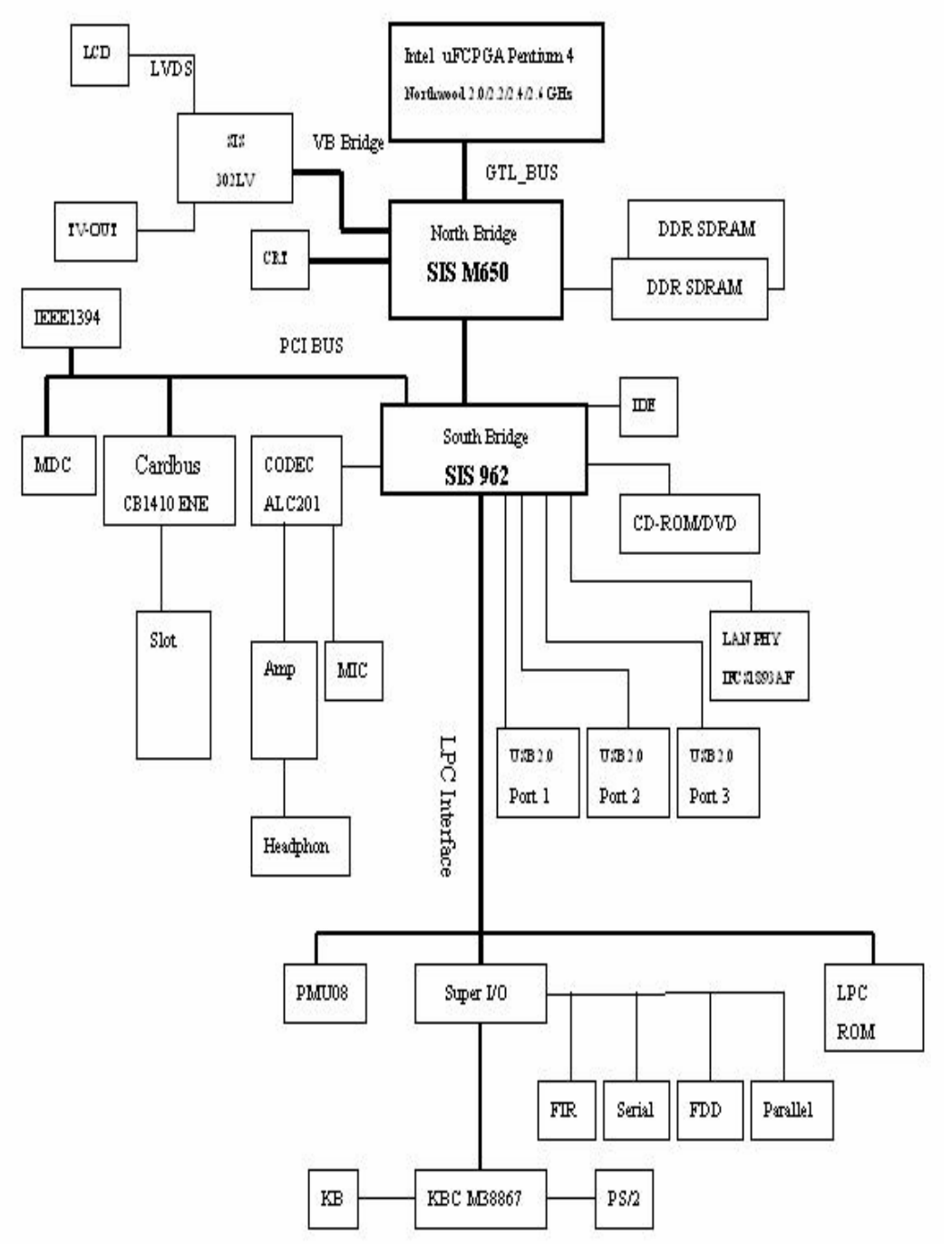


Figure 4-1 M785 Diagram

4.3 Chipset Summary

The M785 notebook consists of following major chipsets:

Controller Chip	Vendor	Description
Processor	Intel	uFCPGA Northwood DT Pentium 4 2.0/2.2/2.26/2.4/2.53 GHz (Desktop, FSB 400/533 MHz) Pentium 4: Integrated 256KB L2 Cache
Core Logic	SIS	SIS 650 + SIS 962
Video Controller	Embedded in SIS 650	Integrated VGA Core with shared 16/32/64MB memory
PCMCIA Controller	ENE	CB1410 PCI-CARDBUS Bridge
Supper I/O Controller	SMSC	LPC47N267
Audio Chip	Embedded in SIS 962	Integrated in South Bridge (SIS 962)
Sound Codec Chip	Realtek	ALC201
Keyboard Controller	EME	KB38867
PMU Controller	Mitsubishi	PMU08, Mitsubishi M38859FFHP
Gas Gauge IC		Included in PMU08
ROM BIOS	SST	49LF040A
Clock Generator	ICS	ICS952001
Temperature Sensor	NS	MAX1617
Modem	NDC	AC97 Interface
LAN	ICS	ICS 1893AF
Bluetooth		None
IEEE1394	AGERE	Fw 801

4.4 System Processor (CPU)

The FIC M785 runs on Intel Pentium 4 based on uFCPGA packaging. It supports CPU with up to 2.53GHz clock speed rating. The processor operates in conjunction with the RAM and ROM memory and the system control logic (e.g. SIS 650) to process software instructions (BIOS, Windows, and Applications).

4.4.1 Intel DT Pentium 4 Product Highlights

- The Pentium 4 processor is available at speeds ranging from 2.0 GHz to 2.80 GHz
- 533-MHz system bus available with speeds at 2.26, 2.40B, 2.53, 2.66 and 2.80 GHz. 400-MHz system bus available with speeds at 1.70, 1.80, 1.80A, 1.90, 2A, 2.20, 2.40, 2.50 and 2.60 GHz.
- 512-KB L2 Advanced Transfer Cache available with speeds from 1.80A GHz to 2.80 GHz. 256-KB L2 Advanced Transfer Cache available with speeds 1.70 GHz to 1.90 GHz.
- The Pentium 4 processor is available in the mPGA-478 form factor
- Featuring the Intel NetBurst microarchitecture

- Supported by the Intel® 850 and Intel® 845 chipset families
- Compatible with existing Intel® Architecture-based software
- Streaming SIMD Extensions 2 (SSE2) Instructions
- Intel® MMX™ media enhancement technology
- Integrated caches include 12-K micro-op trace cache and 8-KB L1 data cache in addition to L2 cache memory
- Support for uni-processor designs
- Based upon Intel's leading 0.13 micron and 0.18 micron manufacturing process technologies. 0.13 micron process with speeds from 1.80A GHz to 2.80 GHz and 0.18 micron process with speeds 1.70 GHz to 1.90 GHz.

Intel's Most Advanced, Most Powerful Processor for Desktop PCs and Entry Level Workstations

The Pentium 4 processor at 1.70, 1.80, 1.80A, 1.90, 2A, 2.20, 2.26, 2.40, 2.40B, 2.50, 2.53, 2.60, 2.66 and 2.80 GHz is designed for desktop PCs, as well as for entry-level workstations. The processor is binary-compatible with previous generation Intel Architecture processors.

Intel® NetBurst™ Microarchitecture

Intel NetBurst microarchitecture delivers a number of innovative features including hyper-pipelined technology, 533-MHz or 400-MHz system bus, Execution Trace Cache, and Rapid Execution Engine, as well as a number of enhanced features such as Advanced Transfer Cache, Advanced Dynamic Execution, enhanced floating-point and multimedia unit, and Streaming SIMD Extensions 2 (SSE2). Many of these innovations and advances were made possible with improvements in processor technology, process technology, and circuit design and could not previously be implemented in high-volume, manufacturable solutions. The features and resulting benefits of the microarchitecture are defined below.

Hyper-Pipelined Technology

The hyper-pipelined technology of the Intel NetBurst microarchitecture doubles the pipeline depth compared to the P6 microarchitecture used on today's Pentium III processors. One of the key pipelines, the branch prediction / recovery pipeline, is implemented in 20 stages in the Intel NetBurst microarchitecture, compared to 10 stages in the P6 microarchitecture. This technology significantly increases the performance, frequency, and scalability of the processor.

533-MHz or 400-MHz System Bus

The Pentium 4 processor's 533-MHz system bus supports Intel's highest performance desktop processor by delivering 4.2 GB of data-per-second into and out of the processor. This is accomplished through a physical signaling scheme of quad pumping the data transfers over a 133-MHz clocked system bus and a buffering scheme allowing for sustained 533-MHz data transfers. The Pentium 4 processor's 400-MHz system bus supports Intel's performance desktop processor by delivering 3.2 GB of data-per-second into and out of the processor. This is accomplished through a physical signaling scheme of quad pumping the data transfers over a 100-MHz clocked system bus and a buffering scheme allowing for sustained 400-MHz data transfers. This compares to 1.06 GB/s delivered on the Pentium III processor's 133-MHz system bus.

Level 1 Execution Trace Cache

In addition to the 8-KB data cache, the Pentium 4 processor includes an Execution Trace Cache that stores up to 12-K decoded micro-ops in the order of program execution. This increases performance by removing the decoder from the main execution loop and makes more efficient usage of the cache storage space since instructions that are branched around are not stored. The result is a means to deliver a high volume of instructions to the processor's execution units and a reduction in the overall time required to recover from branches that have been mis-predicted.

Rapid Execution Engine

Two Arithmetic Logic Units (ALUs) on the Pentium 4 processor are clocked at twice the core processor frequency. This allows basic integer instructions such as Add, Subtract, Logical AND, Logical OR, etc. to execute in one-half a clock cycle. For example, the Rapid Execution Engine on a 2.80 GHz Pentium 4 processor runs at 5.60 GHz.

512-KB or 256-KB, Level 2 Advanced Transfer Cache

512-KB L2 Advanced Transfer Cache (ATC) is available with speeds 1.80A, 2A, 2.20, 2.26, 2.40, 2.50, 2.53, 2.60, 2.66 and 2.80 GHz. 256-KB L2 ATC is available with speeds 1.70 GHz to 1.90 GHz. The Level 2 ATC delivers a much higher data throughput channel between the Level 2 cache and the processor core. The Advanced Transfer Cache consists of a 256-bit (32-byte) interface that transfers data on each core clock. As a result, the Pentium 4 processor at 2.80 GHz can deliver a data transfer rate of 89.6 GB/s. This compares to a transfer rate of 16 GB/s on the Pentium III processor at 1 GHz. Features of the ATC include:

- Non-Blocking, full speed, on-die level 2 cache
- 8-way set associativity
- 256-bit data bus to the level 2 cache
- Data clocked into and out of the cache every clock cycle

Advanced Dynamic Execution

The Advance Dynamic Execution engine is a very deep, out-of-order speculative execution engine that keeps the execution units executing instructions. The Pentium 4 processor can also view 126 instructions in flight and handle up to 48 loads and 24 stores in the pipeline. It also includes an enhanced branch prediction algorithm that has the net effect of reducing the number of branch mis-predictions by about 33% over the P6 generation processor's branch prediction capability. It does this by implementing a 4-KB branch target buffer that stores more detail on the history of past branches, as well as by implementing a more advanced branch prediction algorithm.

Enhanced Floating-Point and Multimedia Unit

The Pentium 4 processor expands the floating-point registers to a full 128-bit and adds an additional register for data movement which improves performance on both floating-point and multimedia applications.

Streaming SIMD Extensions 2 (SSE2) Instructions

With the introduction of SSE2, the Intel NetBurst microarchitecture now extends the SIMD capabilities that MMX technology and SSE technology delivered by adding 144 instructions. These instructions include 128-bit SIMD integer arithmetic and 128-bit SIMD double-precision floating-point operations. These instructions reduce the overall number of instructions required to execute a particular program task and as a result can contribute to an overall performance increase. They accelerate a broad range of applications, including video, speech, and image, photo processing, encryption, financial, engineering and scientific applications.

Data Prefetch Logic

Functionality that anticipates the data needed by an application and pre-loads it into the Advanced Transfer Cache, further increasing processor and application performance.

Features Used for Testing and Performance / Thermal Monitoring

- Built-in Self Test (BIST) provides single stuck-at fault coverage of the microcode and large logic arrays, as well as testing of the instruction cache, data cache, Translation Lookaside Buffers (TLBs), and ROMs.
- IEEE 1149.1 Standard Test Access Port and Boundary Scan mechanism enables testing of the Pentium 4 processor and system connections through a standard interface.
- Internal performance counters for performance monitoring and event counting.
- Includes a Thermal Monitor feature that allows motherboards to be cost effectively designed to expected application power usages rather than theoretical maximums.

4.5 System Core Logic

The system core logic function of the notebook is implemented on the CPU module and motherboard using the SiS650 IGUI HMAC. SiS650 IGUI Host Memory Controller integrates a high performance host interface for Intel Pentium 4 processor, a high performance 2D/3D Graphic Engine, a high performance memory controller, an AGP 4X interface, and SiS MuTIOL Technology connecting w/ SiS962 MuTIOL Media IO. SiS650 Host Interface features the AGTL & AGTL+ compliant bus driver technology with integrated on-die termination to support Intel Pentium 4 processors. SiS650 provides a 12-level In-Order-Queue to support maximum outstanding transactions up to 12. It integrated a high performance 2D/3D Graphic Engine, Video Accelerator and Advanced Hardware Acceleration MPEGI/MPEGII Video Decoder for the Intel Pentium 4 series based PC systems. It also integrates a high performance 2.1GB/s DDR266 Memory controller to sustain t he bandwidth demand from t he integrated GUI or external AGP master, host processor, as well as the multi I/O masters. In addition to integrated GUI, SiS650 also can support external AGP slot with AGP 1X/2X/4X capability and Fast Write Transactions. A high bandwidth and mat ure SiS MuTIOL technology is incorporated to connect SiS650 and SiS962 MuTIOL Media I/O together. SiS MuTIOL technology is developed into three layers, the Multi-t hreaded I/O Link Layer delivering 1.2GB bandwidth to connect embedded DMA Master devices and external PCI masters to interface to Multi-threaded I/O Link layer, the Multi-t hreaded I/O Link Encoder/Decoder in SiS962 to transfer data w/ 533 MB/s bandwidt h from/to Multi-threaded I/O Link layer to/from SiS650, and the Multi-t hreaded I/O Link

Encoder/Decoder in SiS650 to transfer data w/ 533 MB/s from/to Multi-threaded I/O Link layer to/from SiS962

An Unified Memory Controller supporting DDR200/266 DRAM is incorporated, delivering a high performance data transfer to/from memory subsystem from/to the Host processor, the integrated graphic engine or external AGP master, or the I/O bus masters. The memory controller also supports the Suspend to RAM function by retaining the CKE# pins asserted in ACPI S3 state in which only AUX source deliver power. The SiS650 adopts the Shared Memory Architecture, eliminating the need and thus the cost of the frame buffer memory by organizing the frame buffer in the system memory. The frame buffer size can be allocated from 8MB to 64MB.

4.5.1 SiS650 IGUI HMAC 3D Graphic Chipset Features

The SiS650 chipset is ideal for the high performance, high quality, high energy efficient and high integration notebook AGP / PCI / ISA computer systems. The Integrated GUI features a high performance 3D accelerator with 2 Pixel / 4 Text ure, and a 128 bit 2D accelerator with 1T pipeline BITBLT engine. It also features a Video Accelerator and advanced hardware acceleration logic to deliver high quality DVD playback. A Dual 12 bit DDR digital video link interfaced to SiS 301B Video Bridge packaged in 100-pin PQFP is incorporated to expand the SiS 650 functionality to support the secondary display, in addition to the default primary CRT display. The SiS 301B Video Bridge integrates an NTSL/PAL video encoder with Macro Vision Ver. 7.1.L1 option for TV display, a TMDS transmitter with Bi-linear scaling capability for TFT LCD panel support, and an analog RGB port to support a secondary CRT. The primary CRT display and the extended secondary display (TV, TFT LCD Panel, 2'nd CRT) features the Dual View Capability in the sense that both can generate the display in independent resolutions, color depths, and frame rates.

The SiS650 functions and capabilities include:

High Performance Host Interface

- Support Intel Pentium 4 series CPU with data transfer rate of 400/533MHz.
- Support 12 Outstanding Transactions
- Synchronous/Asynchronous Host-t-DRAM Timing
- Master deliver System Bus Interrupt support
- Smart Prefetch mechanism to boost memory read performance
- Support 2M/4M/8M/16M TSEG SMRAM
- Support Defer function to maxi mi ze bus utilization
- Support Dynamic Bus Inversion
- AGTL+ & AGTL compliant bus driver auto compensation

64 Bit High Performance DDR266/PC133 Memory Controller

- Supports DDR266/200 SDRAM or PC133/100 SDRAM
- Support Up to 3 un-buffer Double-sided DIMM DDR266/200
- Up to 1 GB per DIMM with max. memory size up to 1 GB
- Supports 128Mb, 256Mb, & 512Mb SDRAM technology with page size from 2KB up to 16 KB
- Sustains DDR SDRAM CAS Latency at options of 2, 2.5, & 3 clocks

- Programmable buffer strength optimi zing performance and stability
- Dynamic Clock Enable(CKE) control placing the SDRAM into Suspend to DRAM state
- High performance unified memory controller optimi zing the DRAM bus utilization
- Programmable frame buffer size from 8MB and up to 64MB
- 128KB SMRAM space re-mapping to A0000h, B0000h, or E0000h

Integrated A.G.P. Compliant Target/66Mhz Host-to-PCI Bridge

- AGP v2.0 Compliant
- Supports Graphic Window Size from 4MBytes to 256Mbytes
- Supports Pipelined Process in CPU-to- A.G.P. Access
- Supports 8 Way, 16 Entries Page Table Cache for GART to Enhance A.G.P.
- Controller Read/Write Performance
- Supports PCI-to-PCI Bridge Function for Memory Write from 33Mhz PCI Bus to A.G.P. device
- Supports Additional AGP4X/2X interface and Fast Write Transaction

High Throughput SiS MuTIOL connect to SiS962 MuTIOL Media I/O

- Bi-directional 16 bit data bus
- Perform 533MB/s bandwidth in 66MHz x 4 mode
- Distributed arbitration strategy with enhanced mode of contiguous DMA data Streaming
- Packet based, pipelining, and split transaction scheme

High Performance & High Quality 3D Accelerator

- Built-in a high performance 256-bit 3D engine
  - Built-in 32-bit floating point format VLIW triangle setup engine
  - Built-in 2 pixel rendering pipelines and 4 texture units
  - Built-in hardware stereo auto rendering engine
  - Supports Ultra-AGPIITM with 2GB/s bandwidth
  - Up to 143 MHz 3D engine clock speed
  - Peak polygon rate: 10M polygon/sec @ 1 pixel/polygon with Gouraud shaded, point-sampled, linear and bilinear texture mapping
  - Peak fill rate: 286 M pixel/sec, 572 M texture/sec @ 10,000 pixel/polygon with Gouraud shaded and two bilinear textured, Z buffered and alpha blended

- Built-in a high quality 3D engine
  - Supports flat, and Gouraud shading
  - Supports high quality dithering
  - Supports Z-test, stencil test, Alpha-test, and scissors clipping test
  - Supports 16 ROPs
  - Supports Z-buffer, stencil buffer
  - Supports 16/24/32 bits integer Z buffer format and 32 bits floating point Z format
  - Supports 16/32 BPP render buffer format
  - Supports 1/2/4/8 stencil buffer format
  - Supports per-pixel texture perspective correction
  - Supports point-sampled, linear, bi-linear, and dual bi-linear texture filtering
  - Supports up to 2 pixels with 4 bi-linear texels within single cycles
  - Supports up to 2048x2048 texture size

- Supports rectangle structure texture
- Supports 16/24/32 bpp RGB/ARGB texture format
- Supports DTX1, DTX2, DTX3 texture compression formats
- Supports texture transparency, blending, wrapping, mirror, and clamping
- Supports fogging, alpha blending
- Supports vertex fogging and fog table
- Supports specular lighting
- Supports 2X/4X multi-sampling full scene anti-aliasing
- Supports back face culling
- Supports auto-stereo rendering

High Performance 2D Accelerator

- Built-in 128 double-words hardware command queue
- Built-in Direct Draw Accelerator
- Built-in GDI+ Accelerator
- Built-in an 1T pipelined 128-bit BITBLT graphics engine with the following functions:
  - 256 raster operations
  - Rectangle fill
  - Trapezoid fill
  - Color expansion (by 384 patterns registers)
  - Enhanced color expansion
  - Line-drawing with styled pattern
  - NT fractional point line-drawing with styled pattern
  - Multiple scan line
  - Built-in 256 bytes pattern registers
  - Built-in 8x8 mask registers
  - Rectangle clipping
  - Transparent BitBlt with source and destination keys (16 ROPs)
  - Gradient color fill
  - Anti-aliasing text drawing
  - Alpha blended Bitblt
- Supports memory-mapped, zero wait-state, burst engine write
- Built-in 64x64x2 bit-mapped mono hardware cursor
- Built-in 64x64x16 bit-mapped blended color hardware cursor
- Maximum 64MB frame buffer with linear addressing

Complete TV-OUT/Digital Flat Panel Solution

- Built-in secondary CRT controller for independent secondary CRT, LCD or TV digital Output
- Cooperates with “SIS650 Video Bridge” to support NTSC/PAL Video Output
- Digital LCD Monitor
- Secondary CRT Monitor
- Supports Dual 12-bit DDR digital interface to TV encoder and LCD transmitter

High Integration

- Built-in 64x128 CRT FIFOs to support ultra high resolution graphics modes and reduce

CPU wait-state
- Built-in programmable 24-bit true-color RAMDAC up to 333 MHz pixel clock
  - Built-in reference voltage generator and monitor sense circuit
  - Supports downloadable 24 bits RAMDAC for gamma correction in high color and true color modes
  - Support programmable 4 levels DAC current ratio (700, 750, 800, 850 mv)
  - Support programmable pedestal level (0, 0.75mv)
  - Support programmable 4 levels slew rate control
- Built-in two clock generators
  - Integrates PLL loop filter for CRT, 2D, 3D, MPEG and VP Engine
- Built-in two 120x128 video line buffers for MPEG II video playback
- Built-in TV Encoder Interface

Power Management

- Supports VESA Display Power Management Signaling (DPMS) compliant VGA monitor for power management
- Supports direct I/O command to force graphics controller into standby/suspend/off state
- Power down internal Gamma/Palette SRAM in direct color mode
- Supports PCI power management configuration registers for supporting ACPI power down controller
- Power down all internal macro cells such as SRAM, DAC, clock generator when power saving mode
- Supports clock stopping for video accelerator, VP, 2D, 3D and MPEG decoder when disabled
- Supports auto clock throttling for 2D engine, 3D engine

4.5.2 SiS 962 MuTIOL Media I/O Features

The SiS962 MuTIOL Media I/O integrates the Audio Controller with AC 97 Interface, the Ethernet MAC, the Dual Universal Serial Bus Host Controllers, the IDE Master/Slave controllers, and the MuTIOL Connect to PCI bridge. The PCI to LPC bridge, I/O Advanced Programmable Interrupt Controller, legacy system I/O, I/O Advanced Programmable Interrupt Controller and legacy power management functionalities are also integrated.

The Integrated Audio Controller features a 6 channels of AC 97 v2.2 compliance audio to present 5.1-channel Dolby digital material or to generate stereo audio with simultaneous V.90 HSP modem operation. Besides, 4 separate SDATAIN pins are provided to support multiple audio Codecs + one modem Codec maxi mally, effectuating the realization of 5.1 channel Dolby digital material in theater quality sound. Both traditional consumer digital audio channel as well as the AC 97 v2.2 compliant consumer digital audio slot are supported. VRA mode is also associated with both the AC 97 audio link and the traditional consumer digital audio channel.

The integrated Fast Ethernet MAC features an IEEE 802.3 and IEEE 802.3x compliant MAC supporting full duplex 10 Base-T, 100 Base-T Ethernet, or 1Mb/s & 10Mb/s Home networking. 5 wake-up Frames, Magic Packet and link status change wake-up functions in G1/G2 states are supported. Besides, the integrated MAC provides a scheme to store the MAC address without the need of an external EEPROM. The 25 MHz oscillating circuit is integrated so as only an external low cost 25 MHz crystal is needed for the clocking system.

The integrated Universal Serial Bus Host Controllers features Dual Independent OHCI Compliant Host controllers with six USB ports delivering 2 x 12 Mb/s bandwidth and rich connectivity. Besides, each port can be optionally configured as the wake-up source. Legacy USB devices as well as over current detection are also implemented.

The integrated IDE Master/Slave controllers features Dual Independent IDE channels supporting PIO mode 0,1,2,3,4, and Ultra DMA 66/100/133. It provides two separate data paths for the dual IDE channels that sustain the high data transfer rate in the multitasking environment. The MuTIOL Connect to PCI bridge supporting 6 PCI master is compliant to PCI 2.2 specification. The SiS962 also incorporates the legacy system I/O like: two 8237A compatible DMA controllers, three 8254 compatible programmable 16-bit counters, hardwired keyboard controller and PS2 mouse interface, Real Time clock with 256B CMOS SRAM and two 8259A compatible Interrupt controllers. Besides, the I/O APIC managing up to 24 interrupts with both Serial and FSB interrupt delivery modes is supported.

The integrated power management module incorporates the ACPI 1.0b compliance functions, the APM 1.2 compliance functions, and the PCI bus power management interface spec. v1.1. Numerous power-up events and power down events are also supported. 21 general purposed I/O pins are provided to give an easy to use logic for specific application. In addition, the SiS962 supports Intel Speed Step technology and Deeper Sleep power state for Intel Mobile processor.

The SiS 962 MuTIOL Media I/O functions and capabilities include:

High performance MuTIOL Connect Interconnecting SiS's Series NBs

- Bi-directional 16-bit data bus at 266MHZ operating Frequency
- 533MB/s performance in 4x66 MHz mode
- Distributed Arbitration Scheme
- Supports Back to Back Transaction

Integrated Multi-threaded I/O link ensures concurrency of upstream/down stream data transfer

Multiple DMA Bus Architecture

- Concurrent Servicing of all DMA Devices: Dual IDE Controllers, Dual USB HCs, MAC Controller, and Audio/Modem DMA Controller
- Separate 32 Bit Input and Output Data Bus Scheme for each DMA Device
- Advanced Performance Merits of Split & Pipelined Transaction and Concurrent
- Execution among Multi-I/O Devices

Integrated MuTIOL Connect to PCI Bridge

- PCI 2.2 Specification Compliance
- Supports up to 6 PCI Masters
- Two Prefetch cache Buffers support 2 delayed transactions
- Fairness Rotating PCI Arbiter Scheme with Option to Place PCI Master 0 as the Highest Priority
- Write Promotion Mechanism to Guarantee the 10 μs Time Limit of PCI Memory Write

Dual IDE Master/Slave Controller

- Integrated Multithreaded I/O Link Mastering with Read Pipelined Streaming
- Dual Independent IDE Channels Each with 16 DW FIFO
- Native and Compatibility Mode
- PIO Mode 0, 1, 2, 3, 4 and Multiword DMA Mode 0, 1, 2
- Ultra DMA 66/100/133

Universal Serial Bus Host Controller

- Integrated Multithreaded IO Link Mastering
- Dual Independent OHCI Controllers with Root Hub
- Supports up to 6 USB 2.0/1.1 Ports
- Supports Legacy Devices
- Over Current detection Equipped
- Option to Separately Configure Each Port as a Wake-up Source

Integrated Audio Controller with AC97 Interface

- AC97 v2.2 compliance
- 6 Channels of AC97 Audio to Present 5.1-channel Dolby Digital Material (Found in DVD Movies) or to Generate Stereo Audio with V9.0 HSP-Modem Operation
- 4 Separate SDATAIN pins supporting multiple Audio Codecs and one Modem Codec
- Effectuating the Realization of 5.1 Channel Dolby Digital Material in Theater Quality Sound
- Supports Audio and Modem function with Multithreaded I/O link mastering
- Supports two Consumer Audio Digital interface: traditional Consumer Digital Audio Out and AC97 V2.2 Compliance Consumer Audio Digital Interface
- Supports VRA Mode for both AC97 Audio Link and Consumer Audio Digital Interface

Advanced Power Management

- Meets ACPI 1.0b Requirements
- Meets APM 1.2 Requirements
- ACPI Sleep States Include S1, S3, S4, S5
- CPU Power States Include C0, C1, C2 C3
- Supports Intel Speed Step Technology and Deeper Sleep power state for Intel mobile processor
- Power Button with Override
- RTC Day-of-Month, Month-of-Year Alarm
- 24-bit Power Management Timer
- LED Blinking in S0, S1 and S3 States
- Software Watchdog Timer
- Power Supply'98 Support
- PCI Bus Power Management Interface Spec. 1.1

Integrated Keyboard Controller

- Hardwired Logic Provides Instant Response
- Supports PS/2 Mouse Interface

- Password Security and Password Power-Up
- System Sleep and Power-Up by Hot-Key
- KBC and PS2 Mouse Can Be Individually Disabled

Integrated PCI to LPC Bridge

- LPC 1.0 Compliance

Integrated Real Time Clock (RTC) with 256B CMOS SRAM

- Supports ACPI Day-of-Month and Month-of-Year Alarm
- 256 Bytes of CMOS SRAM
- Provides RTC H/W Year 2000 Solution

4.6 Clock Frequency Generator

The notebook utilizes the ICS 952001 chip to supply the system clock needed to run the computer. The following are the available clock frequencies:

System clock:

Clock generator ICS 952001 support:

- 66/100 MHz for Pentium Mobile CPU
- 30/33 MHz for PCI device bus clock use
- 48 MHz for PIIX4M
- 14.318 MHz for PIIX4M refresh use

- 14.318 MHz XTAL for Clock Generator use
- 32.768 KHz XTAL for RTC real time clock
- 8.0 MHz XTAL for K/B controller use
- 14.318 MHz OSC for sound blaster use

4.7 Cache Memory

The primary (L1) and secondary (L2) level cache are integrated on the CPU. By incorporating the cache on-die (meaning it is combined with the CPU into one component), Intel eliminates the need for separate components. The 512KB on-die L2 cache provides three (3X) times faster processor access, resulting in significant improvements in performance. Likewise, an integrated cache means a reduction of connections resulting in increased reliability.

4.8 System Memory

The memory subsystem, implemented on the motherboard, includes System and Video memory. The SIS 650 System Controller chip provides primary control for the system memory.

4.8.1 System Memory

The notebook offers two 64-bit SODIMM (Small Outline Dual Inline Memory Module) sockets for main memory configuration. The memory sockets accept any standard 144-pin SODIMM modules at 128MB, 256MB and 512MB sizes. Memory modules are 2.5V DDR SDRAM type.

4.8.2 Video Memory

The video memory of the notebook is embedded inside the VGA controller chip (SIS 650) with 16,32 and 64MB SMA video memory that can support display resolutions of up to 1024 x 768 at 32-bit 16M color (TFT LCD).

4.9 System BIOS

The notebook utilizes the Phoenix BIOS 4.0 Release 6.0 (Basic I/O System) that contains both the main system BIOS and the VGA BIOS with Shadow BIOS capability. It utilizes Flash EPROM BIOS that allows instant erasing and programming without replacing the EPROM chip.

The BIOS is stored in a 32-pin PLCC package FLASH ROM SST 49LF040A with 4Mbit size and is mounted into the motherboard. While posting the system, the Shadow RAM will be enabled and the ROM will be disabled.

4.10 Video Subsystem

The video subsystem, embedded inside the North Bridge chip and the LCD panel, controls the display output to both the LCD Panel screen and to the external VGA port.

4.10.1 Video Chip Controller

The SIS 650 chipset includes the shared architecture memory of 16/32/64 Mb.
Features summary of the SIS 650 Video Chip Controller:

Resolution, Color & Frame Rate

- Supports 333 MHz pixel clock
- Supports VESA standard super high resolution graphics modes
  - 640x480 16/256/32K/64K/16M colors 85 Hz NI
  - 800x600 16/256/32K/64K/16M colors 85 Hz NI
  - 1024x768 256/32K/64K/16M colors 85 Hz NI
  - 1280x1024 256/32K/64K/16M colors 85 Hz NI
  - 1600x1200 256/32K/64K/16M colors 85Hz NI
  - 1920x1440 256/32K/64K/16M colors 85Hz NI
  - 2048x1536 256/32K/64K/16M colors 75Hz NI
  - Low resolution modes (320x240, 512x384, 400x300)
  - Supports virtual screen up to 4096x4096

Video Accelerator

- Supports single frame buffer architecture
- Supports single video windows with overlay function
- Supports YUV-to-RGB color space conversion
- Supports bi-linear video interpolation with integer increments of 1/2048
- Supports graphics and video overlay function
  - Independent graphics and video formats
  - 16 color-key and/or chroma-key operations

  - Support YUV or RGB format chroma key
  - Rectangular video window mode
  - Video only mode
  - VCD, DVD and up to HDTV playback mode
  - Supports reading-back of current refresh scan line
  - Supports tearing free double buffer flipping
- Supports RGB555, RGB565, YUV422, and YUV420 video playback format
- Supports filtered horizontal up and down scaling playback
- Supports DVD sub-picture playback overlay
- Supports DVD playback auto-flipping
- Built-in two 120x128 video playback line buffers to support 1920x1080 video playback
- Built-in independent Gamma correction RAM
- Supports DCI Drivers
- Supports Direct Draw Drivers

4.10.2 Video Clock

SIS 650 North Bridge provides input to generate VGA internal slate machine, MCLK, and DCLK. Also provides 32.768 KHz O/P for video RAM refresh.

4.11 PCMCIA Controller

The PCMCIA controller of the notebook is implemented on the motherboard using the ENE CB1410 CardBus Controller. The M785 notebook only supports single PCMCIA slot for PCI-Cardbus Bridge.

CARDBUS CONTROLLERS

The CB1410 is an ACPI and PC98/99 logo certified high performance, single slot PC Card controller with a synchronous 32-bit bus master/target PCI interface. This PC Card to PCI bridge host controller is compliant with the 2000 PC Card Standard. This standard incorporates the new 32-bit CardBus while retaining the 16-bit PC Card specification as defined by PCMCIA release 2.1. CardBus is intended to support "temporal" add-in functions on PC Cards, such as Memory cards, Network interfaces, FAX/Modems and other wireless communication cards, etc. The high performance and capability of the CardBus interface will enable the new development of many new functions and applications.

The CB1410 CardBus controller is compliant with the latest ACPI-PCI Bus Power Management interface Specification. It supports all four power states and the PME# function for maximum power savings and ACPI compliance. Additional compliance to On Now Power Management includes D3 cold state support, paving the way for low sleep state power consumption and minimized resume times. To allow host software to reduce power consumption further, the CB1410 provides a power-down mode in which internal clock distribution and the PC Card socket clocks are stopped. An advanced CMOS process is also used to minimize system power consumption.

The CB1410 single PCMCIA socket supports the 3.3V/5V 8/16-bit PC Card R2 cards or 32-bit CardBus R3 cards. The R2 card support is compatible with the Intel 82365SL PCIC controller, and the R3 card support is fully compliant with the 2000 PC Card Standard CardBus specification. The CB1410 is an additional buffer chip for the PC Card socket interface. In addition, the CB1410 supports dynamic PC Card hot insertion and removal, with auto configuration capabilities.

The CB1410 is fully complains with the 33Mhz PCI Bus specification, v2.2. It supports a master device with internal CardBus direct data transfer. The CB1410 implements FIFO data buffer architecture between the PCI bus and CardBus socket interface to enhance data transfers to CardBus Devices. The bi-directional FIFO buffer permits the CB1410 to accept data from a target bus (PCI or CardBus interface) while simultaneously transferring data. This architecture not only speeds up data transfers but also prevents system deadlocks.

The CB1410 is a PCMCIA R2/CardBus controller, providing the most advanced design flexibility for PC Cards that interface with advanced notebook designs.

CB1410 FEATURES – only Single Slot Solution

- Supports only one PCMCIA 2.1 and JEIDA 4.2 R2 cards or 2 CardBus cards
- ACPI-PCI Bus Power Management Interface Specification Rev 1.1 Compliant
- Supports OnNow LAN wakeup, OnNow Ring Indicate, PCI CLKRUN#, PME#, and CardBus CCLKRUN#
- Compliant with the 33Mhz PCI Specification V2.2, 2000 PC Card Standard 7.1 for CB1410
- Yenta™ PCI to PCMCIA CardBus Bridge register compatible
- ExCA (Exchangeable Card Architecture) compatible registers map-able in memory and I/O space
- Intel™ 82365SL PCIC Register Compatible
- Supports PCMCIA_ATA Specification
- Supports 5V/3.3V PC and 3.3V Cardbus cards
- Supports two PC Card or CardBus slots with hot insertion and removal
- Supports multiple FIFOs for PCI/CardBus data transfer
- Supports Direct Memory Access for PC/PCI and PCI/Way on PC Card socket
- Programmable interrupt protocol: PCI, PCI+ISA, PCI/Way, or PC/PCI interrupt signaling modes
- Win'98 IRQ and PC-98/99 compliant
- Parallel or Serial interface for socket power control devices including Micrel and TI
- Integrated PC 98/99 -Subsystem Vendor ID support, with auto lock bit
- LED Activity Pins
- CB1410 supports D3cold state PME# wakeup; 3.3Vaux Power; and Zoomed video buffer enable pins
- CB1410: "Built-in" live video, high throughput, multimedia ZV ports support without

additional buffers; 3V card protection during host system suspend with Auto Card VS# resensing; dedicated ZV output port to LCD controller

SmartCardBus™ (OZ711E1/OZ711E2) combines a Smart Card reader and CardBus controller in a single IC. In addition to meeting PC Card standards, SmartCardBus is compliant to Microsoft PC/SC, ISO 7816-1, -2, -3 electrical specifications, standard protocols including T = 0, T = 1, and synchronous and asynchronous formats. SmartCardBus lowers the cost of ownership of e-commerce and corporate security Smart Card applications.

4.12 Audio Subsystem

The audio subsystem is integrated inside the South Bridge chip on the motherboard. Refer to the System Core Logic section of this chapter.

An internal two-way mini speaker and microphone provide the notebook with mobile sound generation and recording capabilities. In addition, a set of 3.5mm bayonet socket (1/8" minijack) connectors allow for external microphone, line inputs, and headphone outputs.

4.13 Keyboard and Pointing Device

The Keyboard Subsystem of the notebook is implemented on the Motherboard and Keyboard Assembly using the ENE KB3886 keyboard controller chip and the Phoenix MultiKey/M3886L keyboard controller firmware. This chip controls the internal built-in keyboard, the built-in touchpad pointing device, as well as the external PS/2 keyboard and mouse port. The keyboard controller allows simultaneous use of both the internal and external keyboard and PS/2 mouse.

The M785 membrane keyboard is an 86-key IBM 101-key enhanced compatible keyboard with standard characters and 12 function keys including an embedded numeric keypad. See Chapter 1 for more information.

The pointing device subsystem consists of the built-in Synaptics touch pad pointing device module on the system top cover assembly and a pre-programmed Mitsubishi 38869M8 micro-controller that interfaces the mouse device to the Motherboard. The touch pad module is connected to battery board through a 6-pin FPC cable. An external PS/2 port also supports the use of an external PS/2 compatible mouse where the system automatically detects on system power up and runs both internal and external mouse simultaneously.

The Synaptic touch pad, a pointing device for personal computers, detects the position of a finger over a touch-sensitive area. To move the cursor, the user lightly slides a finger over the smooth sensor area. To 'click', the user gently taps on the surface.

The ultra-thin module is the thinnest PCB based touchpad available today. It is a capacitive sensor - the finger is detected by measuring its effect on an array of capacitive lines integrated into the PC board. The pad senses both the finger's position and its contact area (X, Y, and Z). The area of contact is a measure of applied pressure. One side of the module PC board is the sensor surface; electronic components are mounted on the other side. The sensitive area is protected by a layer of smooth and durable mylar.

The Synaptic touch pad communicates with the host via a standard PS/2 mouse or trackball interface. It is fully compatible with the standard Microsoft mouse driver. The module connector includes the PS/2 signal pins, power supply pins and two connections for external button switches.

The Synaptic touch pad includes a special "edge-motion" feature that allows the user to extend a drag operation when the finger reaches the edge of the sensor pad. The cursor continues to coast in the indicated direction when the finger is held against the edge.

4.14 Disk Drives Subsystem

The disk drives subsystem, implemented on the Motherboard and on the associated internal hard disk drive assembly and device bay, provides disk storage for all system software and user files.

The notebook is equipped with high capacity hard disk drive using Enhanced IDE controller with LBA (Logical Block Addressing) and Ultra DMA mode support.

The SIS 691 controller chip provides the Primary IDE controller for the internal hard disk, and the Secondary Master for the CD-ROM.

The floppy disk drive supports standard 3.5-inch 720KB and 1.44MB mini-diskettes while adding support for 1.2MB (3 Mode) mini-diskettes for Japanese market.

The notebook uses the 24X-speed IDE CD-ROM Drive that reads digital data stored on CD-ROM at 24 times faster rotational speed. The CD-ROM drive supports CD-DA transfer over ATAPI function that the host system can read CD audio data. The drive also supports Photo-CD Multi-session disc compatibility and Multimedia PC-3 specification compatibility. The notebook also could use the 8X+ speed IDE DVD-ROM Drive that reads DVD digital data stored on DVD-ROM at 8 times faster rotational speed.

4.15 Power Subsystem

The Power Subsystem consists of the following major sections:

4.15.1 AC Power Adapter

The computer is equipped with a 90W universal AC power adapter that converts AC voltage (100 to 240VAC, 50 to 60Hz) into DC voltage used to operate the notebook and charge the batteries.

4.15.2 Internal Battery Pack

The computer utilizes Lithium-Ion (Li-Ion) that provides DC power for the notebook and real time clock battery on the motherboard when the AC Adapter is not connected to the computer. The normal charging time for the battery is around 2 hours when computer is turn off while it should take around 8 hours when the computer is running. Running time of battery is around 2 hours.

4.15.3 DC-DC Module of Motherboard

The DC-DC module receives approximately 12VDC from the battery pack and uses this input voltage to generate multiple regulated output voltages to provide power for all internal notebook board assemblies.

4.15.4 LCD Inverter Board Assembly

The LCD Inverter Board Assembly is located in the LCD Panel Assembly. It converts the +12VDC input directly from the Battery Pack into a high voltage AC output used to light the CCFT (Cold-Cathode Fluorescent Tube).

4.16 Micro-P Subsystem (PMU-08)

The micro controller Mitsubishi PMU08 acts as a supplement for the power management control. It supports many functions via the SMBus interface.

The system communicates with the PMU08 via the SMBus interface. The SMBus host (M38869) should be first initialized before starting the transaction. The following is the procedure for system communication with PMU08:

1. Enable SMBus interface by writing 01h to SmbHstCfg register.
2. Get SMBus I/O port base address by reading from SmbBA register.
3. Clear SMBus status by writing 1Eh to SmbHstSts register.
4. Write the PMU07 slave address to SmbHstAdd register.
   - Send command to PMU08 -- Slave address is 04h.
   - Read data from PMU08 -- Slave address is 05h.
5. Write the desired command to SmbHstCmd register.
6. Write the desired parameters to SmbHstDat0 (High byte) and SmbHstDat1 (Low byte) registers if the system wants to send command to PMU08.
7. Wait for SMBus interrupt occurred by monitoring SmbHstSts register INTR bit.
8. Get the desired data by reading from SmbHstDat0 (High byte) and SmbHstDat1 (Low byte) registers if the system wants to read data from PMU08.

Features Summary of the Micro-P:

- 5 channels 8-bit analog to digital converter
- Timer0: 8-bit tuner/counter with 8-bit prescaler
- Timer1: 16-bit timer/counter. TMR1 can be incremented during sleep via external crystal/clock
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Capture, Compare, PWM module
- Synchronous Serial port (SSP) with SPI and I^2C
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI)
- Brown-out detection circuitry for Brown-out Reset (BOR)
- 2K bytes program memory
- 128 bytes data memory
- 22 I/O pin
- 8 interrupt sources

Chapter 5

Maintenance & Disassembly

5.1 Introduction

This section contains preventive and corrective maintenance procedures for the M785 notebook. The first part of the section describes the computer cleaning procedures and preferred handling procedures for sensitive components (e.g. disk drives, LCD, CPU, batteries).

The second part of the chapter identifies all field replaceable parts with the remainder explaining the removal and replacement procedures for the field replaceable parts.

5.2 Preventive Maintenance

Preventive maintenance is limited to cleaning the plastic case, the keyboard, and the display screen and cleaning the floppy drive heads as required.

5.2.1 Cleaning the Computer

When it is necessary to clean the plastic case and keyboard, use a soft lint-free cloth, slightly dampened with a mild detergent solution, or use the contents of any commercially available computer cleaning kit.

> i Never use alcohol, petroleum-based solvents, or harsh detergents to clean the notebook. Also, do not spray any liquids directly on the computer case, keyboard, or screen. If the liquid-crystal display (LCD) screen has become smeared or dusty, clean the screen by first applying a mild glass cleaner to a soft, clean, lint-free cloth, and gently wipe the glass. Never apply liquids directly on the screen surface. Moreover, do not use paper towels to clean the display screen. Paper can scratch the display screen matte.

5.2.2 Protecting the Disk Drives

To protect the disk drives and data, back up the system disk periodically on floppy diskettes. Periodically use a head-cleaning diskette in the floppy diskette drive to prolong the life of the drive and to help maintain data integrity.

5.2.3 Maintaining the LCD Quality

When it comes to screen problems, heat plays a big part. After a good working session, the typical routine is to shut the machine and close the cover. But the display surface - no matter what type it is - and the components inside the computer radiates heat; when you close the cover, you trap the heat against the screen. Leave the computer's cover open for about ten minutes while the heat disperses. Make this a habit.

5.2.4 Maintaining the Hard Disk Drive

The hard disk drive is one of the most common parts that always gets problem. Here is some preventive maintenance that you can do when handling the hard disk.

- Always back up the data files from the hard disk.
- Run a virus detecting program for possible virus infected area on the hard disk.
- Use **SCANDISK** to correct any errors found in the directory and File Allocation Table (FAT). This will also free up space from any unused sectors.
- Never turn the computer off when the hard disk is being accessed.
- Never move or raise the computer while the hard disk is being accessed, most especially don't jar the hard disk as this may cause a hard disk crash.
- Use hard disk system tools like **Disk Defragmenter** under Windows. This reorganizes your hard disk by eliminating fragmentation and improves the hard disk access time.

5.2.5 Handling the Computer Battery Packs

The battery packs furnished with the computer require reasonable care and handling to ensure efficient operation and maximum life. Periodically inspect the battery terminals and the batteries for evidence of corrosion and oxide build-up.

To ensure that the battery packs endure normal life cycle, always observe the following precautions when handling the battery packs:

- Do not drop the battery packs or subject them to excessive shock and vibration.
- Do not expose the battery packs to direct sunlight, moisture, or chemical compounds.
- Do not disassemble the battery packs.
- Do not use the battery packs to power other devices.
- Do not short the battery leads or connect the battery with reversed polarity.
- Never attempt to charge the battery packs in any way other than as described in this manual and the User's Manual.
- Always charge the battery packs as soon as possible after a low battery indication.

5.3 Required Tools and Equipment

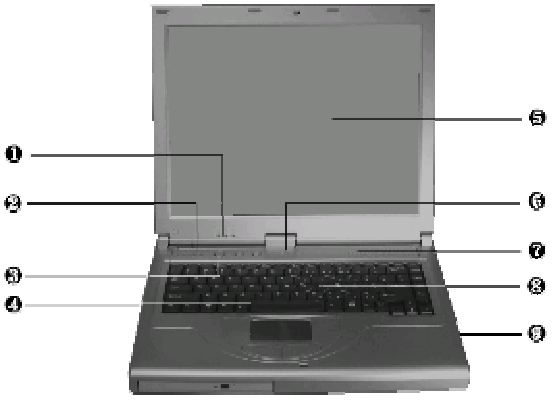
To troubleshoot and repair PC systems properly, you need a few basic tools:

- Tweezers
- Small flat-blade screwdriver
- Small Phillips screwdriver
- Regular size Phillips screwdriver
- Small Hex-bolt screwdriver

> i All boards, options, and peripherals contain components that are sensitive to static electricity. When handling any of these items, use wrist or ankle grounding straps and grounded working mats. When moving or storing items, use the anti-static bags supplied with the items.

5.4 Notebook Field-Replaceable Parts and Assemblies

The notebook contains two major assemblies: The Cover Display LCD Assembly and the System Unit Assembly.



❶	Power Status LED Indicator	❷	Built-in Stereo Speakers	❸	Power On / Resume Button
❹	Easy Button	❺	Color LCD Panel	❻	Status LED Indicator
❼	Built-in Stereo Speakers	❽	Keyboard	❾	GlidePad Pointing Device

Figure 5-1 Cover Display and System Unit Assembly

5.4.1 Cover-Display LCD assembly

The Cover-Display LCD Assembly includes the following major Field Replaceable Units/parts (FRUs):

- **LCD Face and Back Panel Cover**
  These parts are used to cover the whole LCD Panel assembly, which includes the LCD Display Module, the LCD FPC cables, and inverter board.

- **LCD Display Module**
  14.1" / 15" LCD (Liquid Crystal Display) screen is used for output display. This part is assembled together with LCD Power Inverter Board, and LCD cables contained inside the whole LCD Panel. Handle this part with care against static electricity and accidents that can break the LCD.

- **LCD Power Inverter Board**
  This part or PCB (Printed Circuit Board) is used to provide high voltage to the CCFT (Cold Cathode Fluorescent Tube) of the notebook's LCD backlighting. It is connected to the right side of the LCD display screen and attached to the back panel by a screw. Exercise safety electrical precautions in handling and servicing this part. The circuit board also includes the function for displaying the power status and battery charge LED indicators.

- **LCD FPC Cable**
  The LCD FPC cable is used to convert output signals from the motherboard in driving the LCD display screen. The cable is connected to the back of the LCD Panel.

5.4.2 System Unit Assembly

The System Unit Assembly comprise of several assemblies of which can be divided into two major sub-assemblies.

- The System Top Unit Assembly.
- The System Base Unit Assembly.

The following System Top Unit Assembly includes the following major Field Replaceable Units/parts (FRUs):

- **Glidepad Touch Pad Module Assembly**
  The touch pad (glide pad) pointing device module is assembled at the underside of the top cover with the sensor pad exposed on the top. The assembly comprises of the glide pad board, the glide pad converter board, the select buttons bracket casing, the insulator sheet, the glide pad FPC cable, and the glidepad wire cable. The glide pad board is assembled just underneath the select button assembly. It provides a FPC cable connector for the glide pad converter board. The converter board on the other hand provides the wire cable connector to the battery board of the system unit.

- **Keyboard Panel Assembly**
  The keyboard is assembled on top of the system unit and connected to the main board's keyboard FPC type connector. The keyboard is also secured on the system's top unit casing. There are no screws attached to the keyboard.

- **Thermal Plate and Fan Exhaust Unit**
  The Thermal Plate was located on the upper-right side of the system unit. To remove nine screws by cross screw driver and then you could lift it up easily~ The Fan Exhaust just behind the thermal pad unit. There are four screws securing the Fan Exhaust Devices to the CPU module inserted on the motherboard.

- **Keyboard Cover Assembly**
  The keyboard cover is a thin bracket for holding the keyboard as well as covering the base unit. It is also includes the power button, easy buttons, and status LED cover moldings.

The following System Base Unit Assembly includes the following major Field Replaceable Units/parts (FRUs):

- **Battery Pack**
  This is one of the more easily replaceable parts. The battery pack is found on the right side on the base unit and can be easily removed by pressing the latch underneath the unit and pulling the battery on its handle. The battery pack is replaced as a whole and must not be opened for repair.

- **Hard Disk Drive Module**
  The Hard Disk Drive is attached on the lower-left side of the system base unit located just below the palm rest pad. The HDD is secured by one screw. The HDD module is a 2.5-inch hard disk drive with a maximum height of 9.5mm. The hard drive module assembly is attached to the motherboard through the HDD connector.

- **Audio Board**
  The audio board is a daughter board that is attached to the backside of system main board

- **CD-ROM / DVD-ROM / CD-RW Drive Assembly**
  The CD-ROM / DVD-ROM / CD-RW Drive Assembly is attached on the left side of the base unit and is secured with one screw.

- **USB Floppy Disk Drive**
  The USB Floppy Drive for any USB port of the base unit. More convenience to use~

- **CPU**
  The Pentium 4 uFC-PGA socket is found on the top right part of the motherboard. You will need a flat screwdriver for removing or installing the CPU. Refer to Chapter 2 on how to install and upgrade the CPU.

- **Speaker Assembly**
  The internal speakers of the notebook are assembled into front side of the System. The Speakers are secured into a slot and speaker cable connector is attached into the main board.

- **Motherboard Assembly**
  The Motherboard assembly is the most important part of the notebook. It contains the entire major chipsets including the core logic, PCMCIA, memory, and BIOS to operate the whole computer. It also includes the sockets, connectors and ports completing the functionality.

- **System Base Unit Case**
  The System Base Unit Case is where the Motherboard is placed. It includes openings for the battery, CD-ROM and PCMCIA equipment.

5.5 Parts Removal and Replacement Procedures

This section contains the field service-level removal/ replacement procedures for the M785 notebook. The M785 notebook is designed for optimum modularity in order to make field replacement and maintenance easy and efficient.

5.5.1 Removing the Battery Pack

The procedure for removing and replacing the battery pack is as follows:

1. The battery pack is located on the left side of the system unit.
2. To release the battery pack, locate the battery latch found underneath the unit.
3. Push the latch to release the lock and at the same time pull the battery pack out.

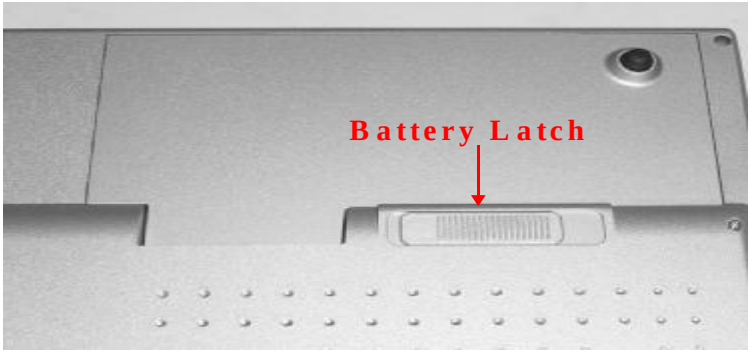


Figure 5-2 Remove Battery Pack

5.5.2 Removing the Keyboard cover and Keyboard K/B FPC

The internal keyboard is located above the system top unit and is fitted in without screws on the top unit case. Follow the steps below on how to remove the keyboard and heat sink plate:

1. Remove keyboard cover by gently bending it and sliding it towards in front of you.

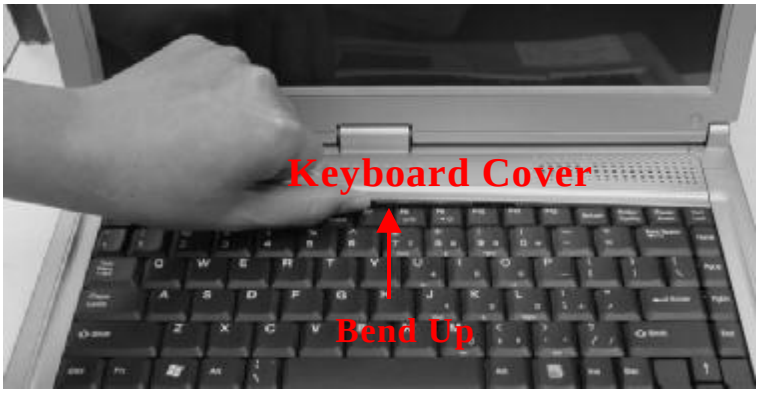


Figure 5-3 Remove Keyboard Cover

2. Remove keyboard you can see there are three screws to remove them.

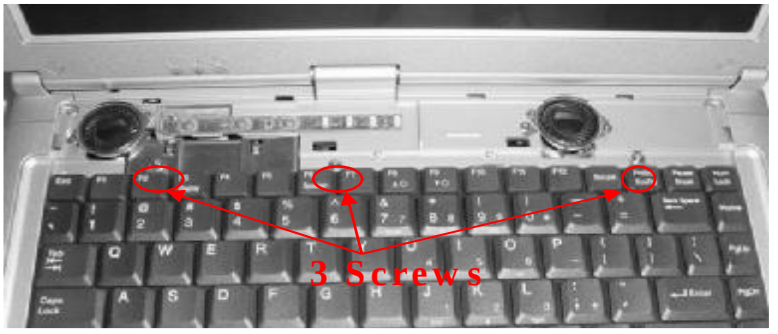


Figure 5-4 Remove Three Screws on the Keyboard

3. Release keyboard cable by sliding the ZIF connector towards upward direction.

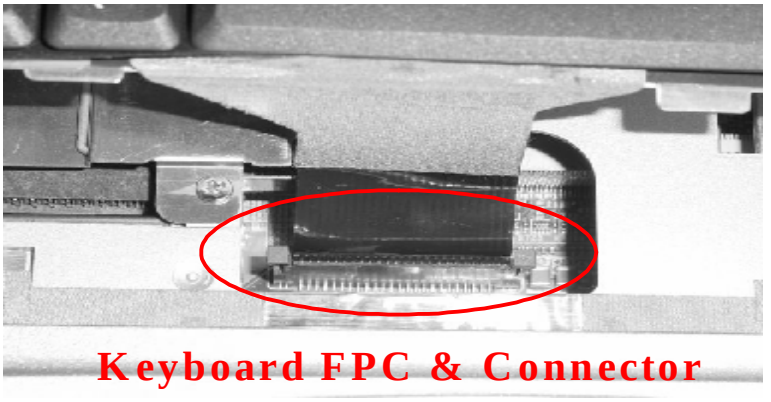


Figure 5-5 Remove the Keyboard FPC

5.5.3 Removing the Hinge Cover

1. There are two screws on the hinge cover and that should be removing as the picture indicated.

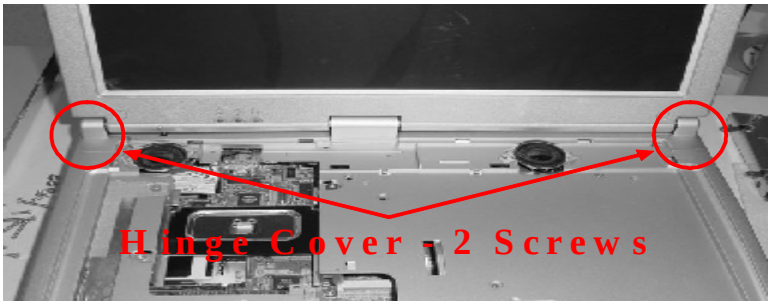


Figure 5-6 Remove the Hinge Cover

5.5.4 Removing the Internal Hard Disk Drive

The notebook provides a built-in hard disk for the primary IDE controller. The HDD is an industry standard 2.5" IDE disk drive with a maximum height of 9.5mm, and can be upgraded with another standard 2.5" HDD with a maximum height of 9.5mm.

1. Find out the built-in hard disk secured with two screws at the right corner of the hard disk. Remove that screw and carefully pull the hard disk module from the connector.

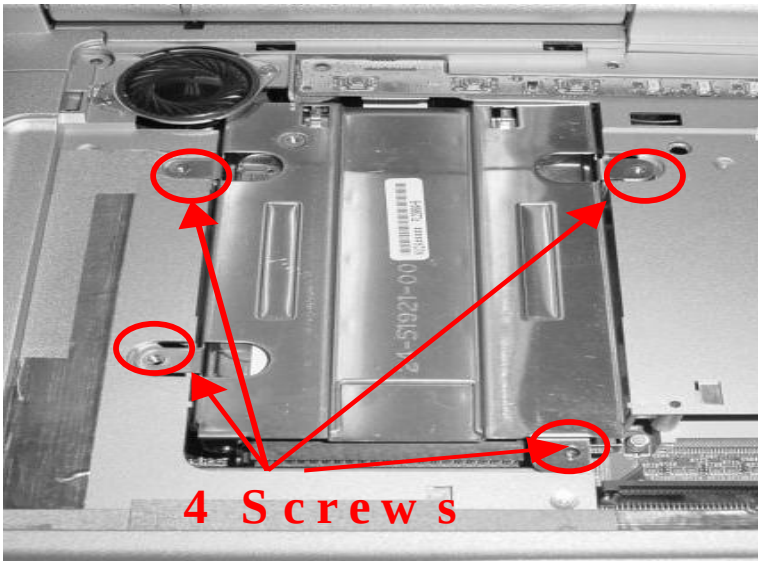


Figure 5-7 Removing the four Screws of this Securing HDD

2. Removing the four screws of frame HDD bracket plate. Two small ones of them are at the front side, and others are at the both sides

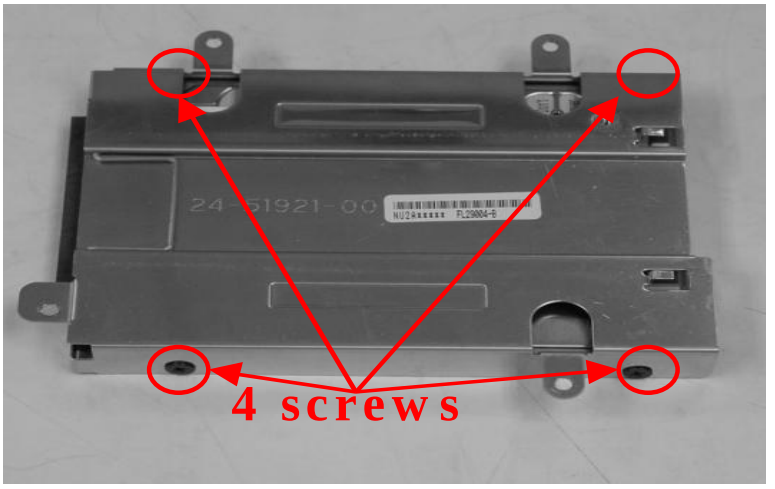


Figure 5-8 Screws Locations of the frame HDD bracket plate

5.5.5 Removing the LED Board

1. To release the LED board, there are two screws on the LED board.
2. Please also take out FPC gently from the LED board.

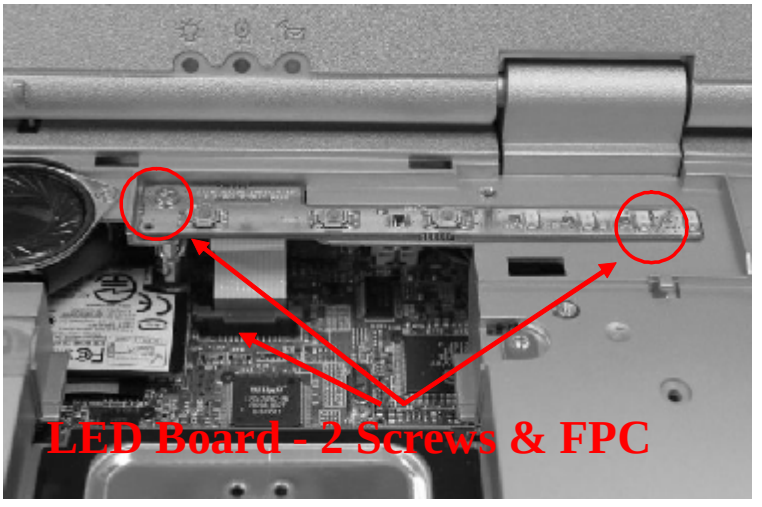


Figure 5-9 Removing the LED Board

5.5.6 Removing the Top Cover

The procedure for removing the top cover is as follow:

1. Please see the location of top cover as the below picture shown.

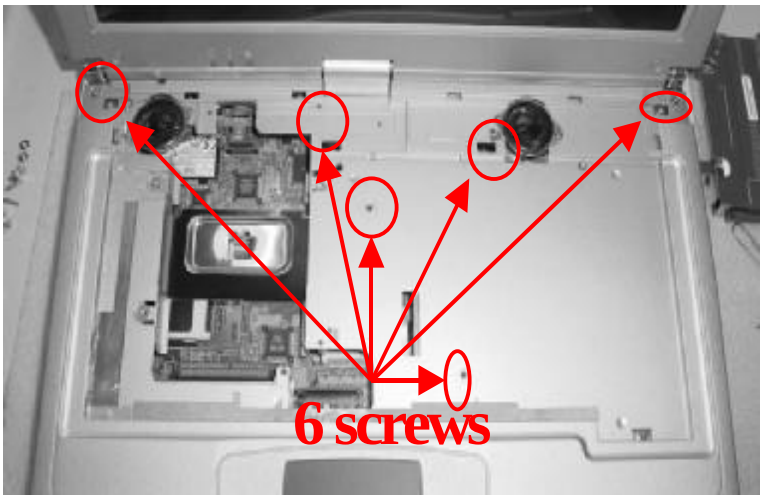


Figure 5-10 Location of Top Cover

2. To remove the top cover, you also need to remove the six screws from the bottom case.

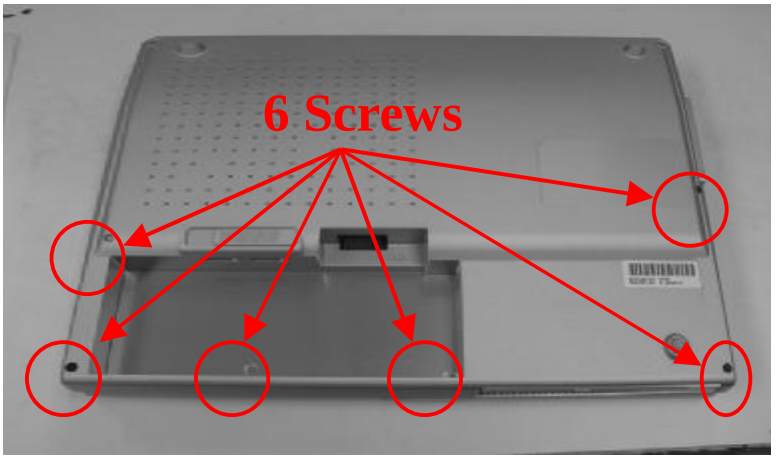


Figure 5-11 Removing the six screws of bottom case

3. There are also four screws from the rear side of this M785 notebook.

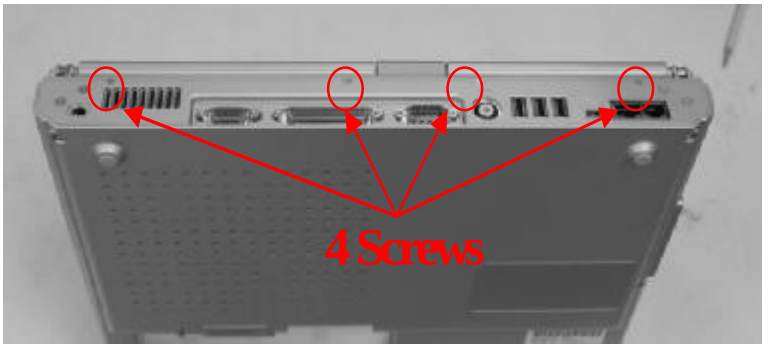


Figure 5-12 Removing the four screws from the rear side

4. Open the top cover and remove G/P from FPC connector

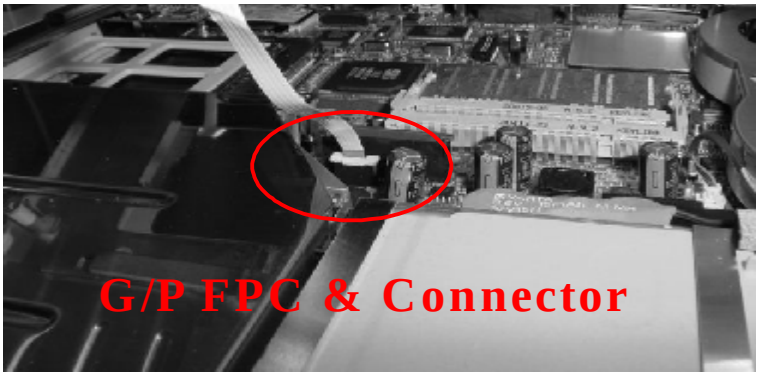


Figure 5-13 Removing the top cover and G/P cable

5. Please make sure there are two connectors for speakers, and that has to be releasing gently as the picture shown.

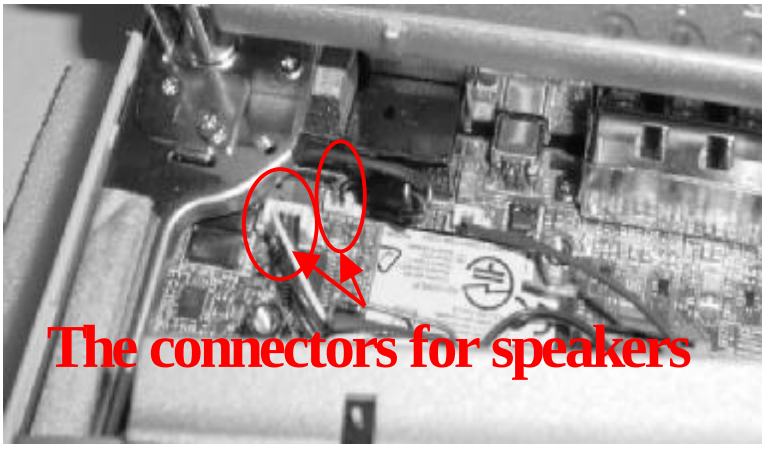


Figure 5-14 Removing the Connectors for Top Cover

5.5.7 Removing the LCD Panel

The procedure for removing the LCD Panel is as follows:

1. Following the steps above in removing of the keyboard cover, keyboard, hinge cover, hdd drive, LED board and top cover.

2. There are three screws as the picture indicated for removing LCD panel to the system unit. Also, there are two hex-bolds and FPC connector to release on the motherboard.

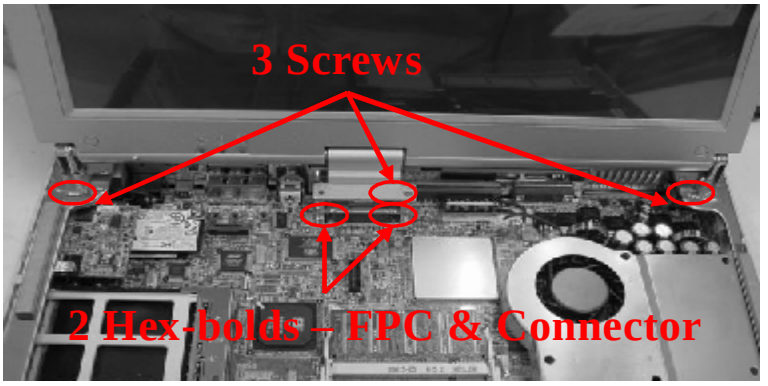


Figure 5-15 Removing the three screws and two hex-bolds on the LCD panel

3. To remove the four screws of rear side for the LCD panel

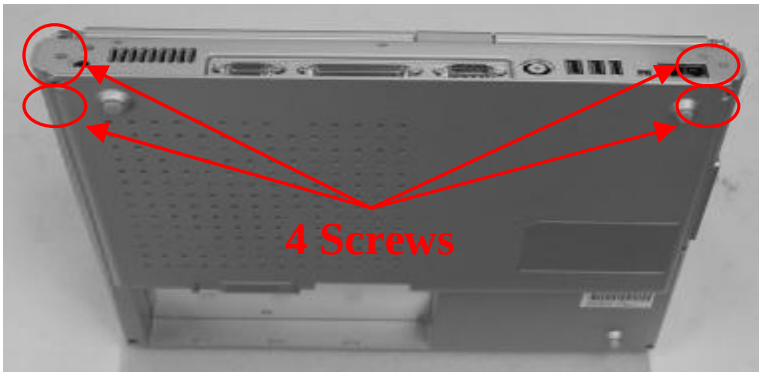


Figure 5-16 Four Screws Securing the LCD panel

5.5.8 Removing the internal LCD panel

The procedure for removing the internal LCD Panel is as follows:

1. There are six screws from LCD front cover slowly pullout the LCD panel

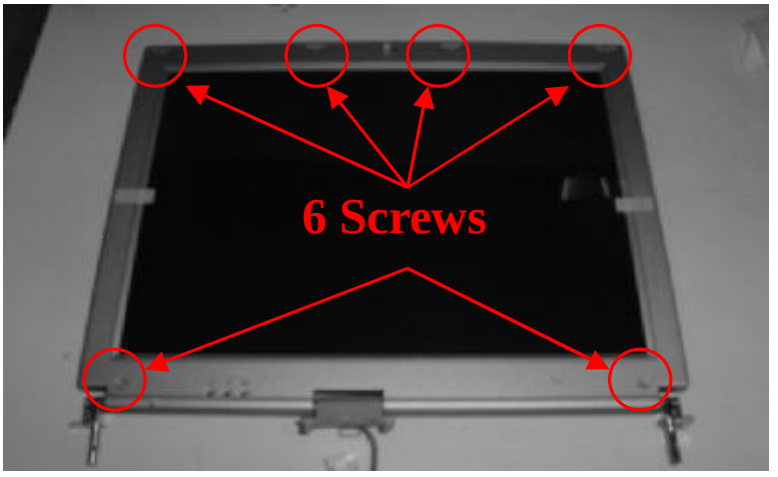


Figure 5-17 Removing the Six screws for LCD front cover

2. To remove the LCD back cover, you need to disassemble the LCD cover back. There are 18 screws as shown in the figure below. Then, carefully removing the back cover from the LCD panel.

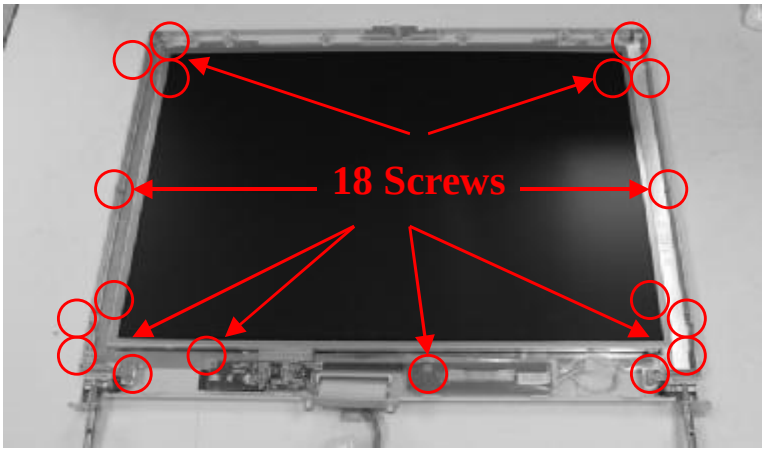


Figure 5-18 Removing the 18 screws from back cover

3. To remove the internal LCD panel, there is a FPC and inverter that need to release it as the picture shown.

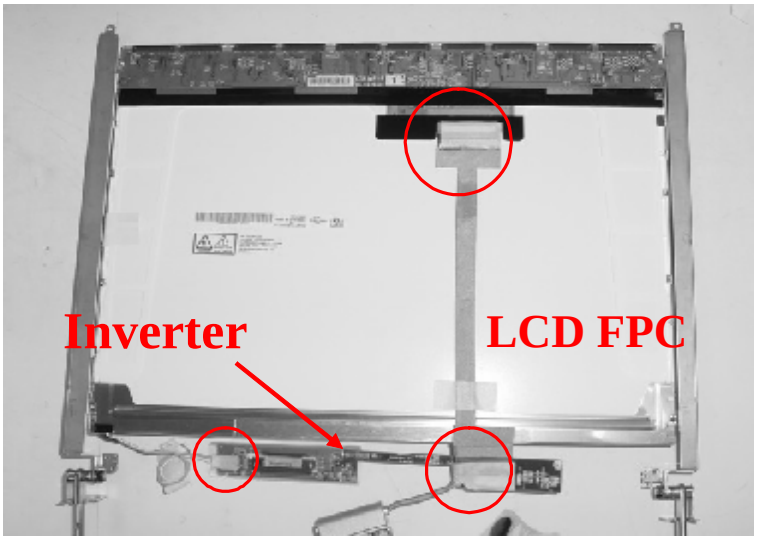


Figure 5-19 Removing the internal FPC and inverter

5.5.9 Removing the CD-ROM module

1. To remove the CD-Rom, there are two screws removing and pushing the CD-Rom out to the direction.

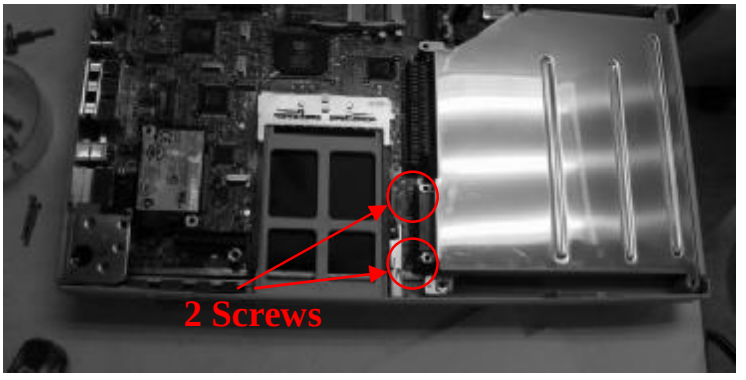


Figure 5-20 Removing and pushing the CD-Rom

2. Removing the four screws of CD-Rom bracket as the picture indicated.

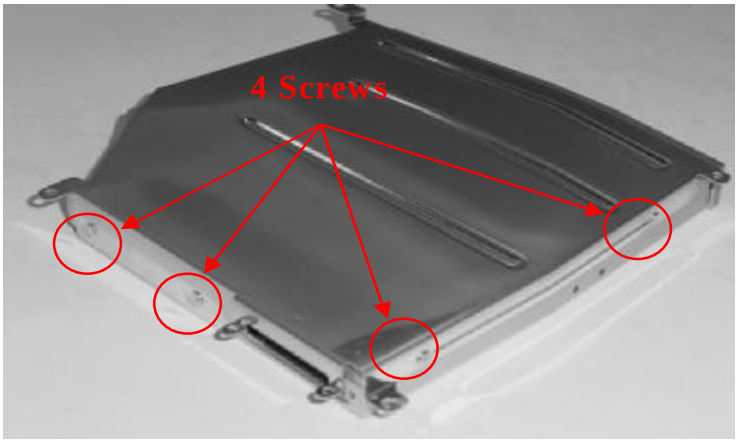


Figure 5-21 Removing the four screws of CD-Rom bracket

5.5.10 Removing the Bottom Bracket

1. There are three screws on this bottom bracket for removal as the picture indicated.

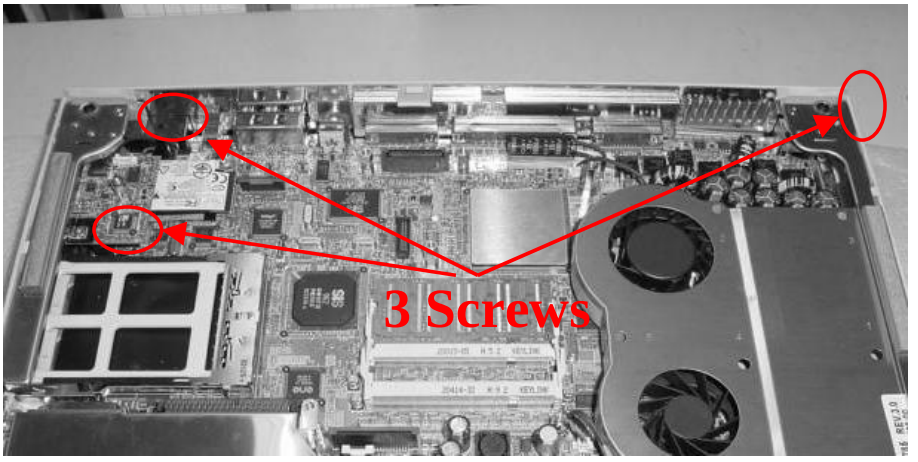


Figure 5-22 Removing the bottom bracket of three screws

5.5.11 Removing the Heat Sink

1. Removing the heat sink, there are five screws and two fan cables as the picture shown.

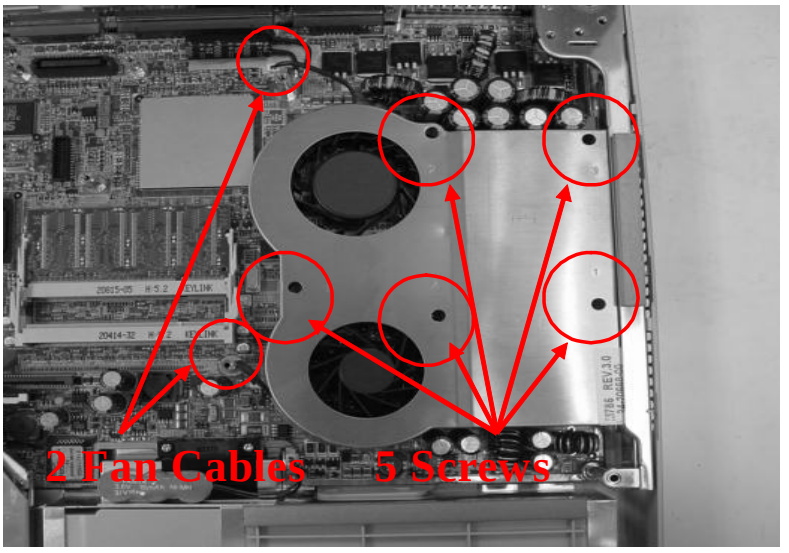


Figure 5-23 Release Heat Sink

5.5.12. Removing the Intel CPU

The M785 features Intel Pentium 4 uFC-PGA Processors. It is located on the upper left side of the system motherboard.

To install or replace the CPU, follow the steps below:

1. Before removing the CPU module, you need first to disassemble keyboard and heat sink plate.

2. Using a flat screwdriver, turn the socket lock counter-clockwise direction to unlock CPU from the socket.

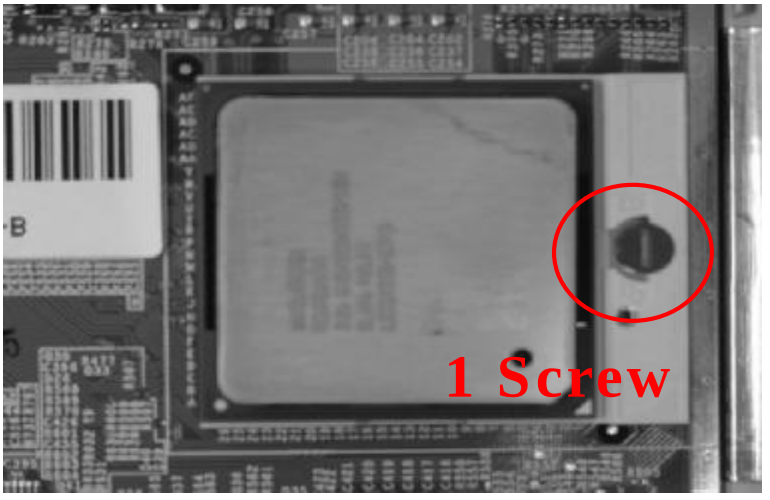


Figure 5-24 CPU Assembly

5.5.13 Removing the Audio Board

The procedures for removing and replacing the audio board is as follows:

1. The audio board was located in the left side.
2. Removing it and life it up from the socket carefully
3. There is one hex-bold screw as the picture shown.

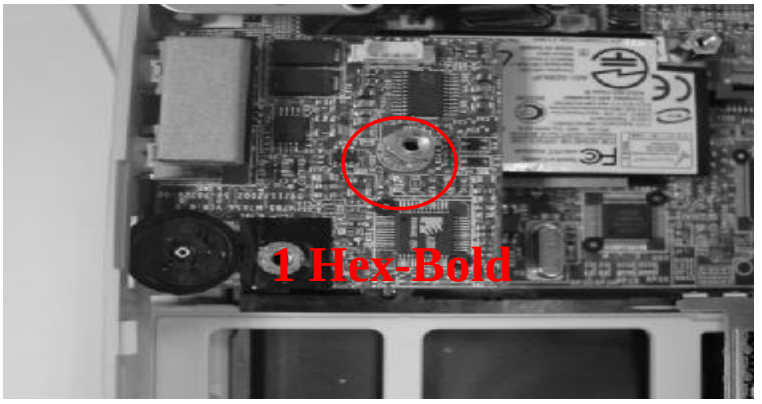


Figure 5-25 Removing the audio board

5.5.14 Removing the MDC Board

1. There are two hex-bold screws for removing the MDC board

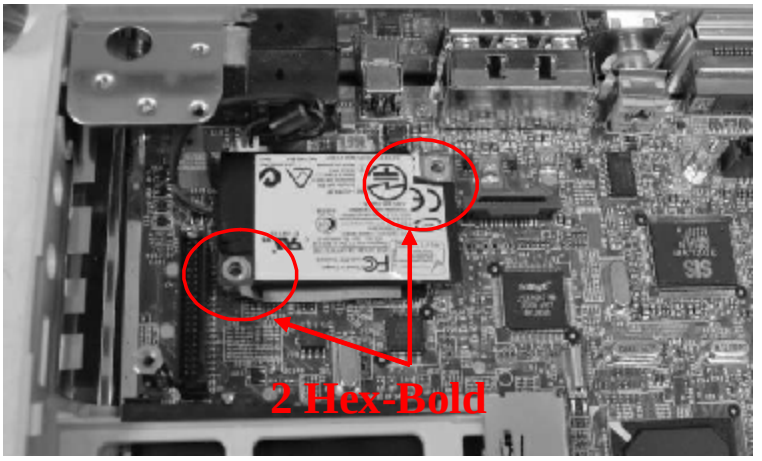


Figure 5-26 Removing the MDC board

5.5.15 Removing the Sub-battery

1. there is one connector on the motherboard of this sub-battery as the picture shown.

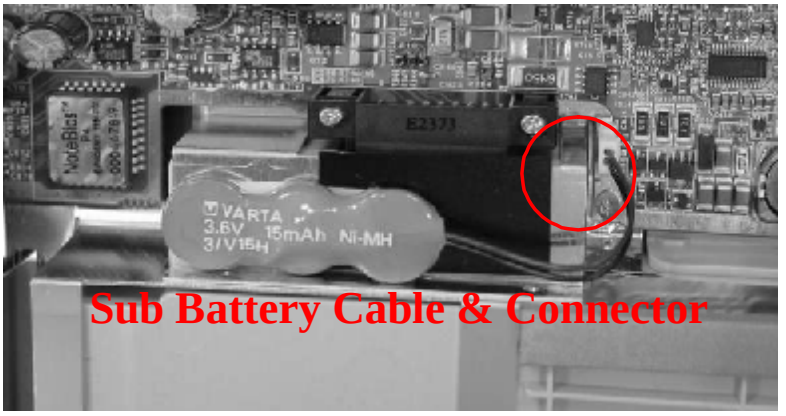


Figure 5-27 Removing the sub-battery

5.5.16 Removing / Replacing the Motherboard

The motherboard contains the major chipset and components needed to run the M785 notebook. Follow the steps below on how to remove and replace the motherboard:

1. Before removing the motherboard, you need first to disassemble the all basis unit modules mentioned in the previous sections.

2. On the motherboard, there are seven hex bolts on the motherboard and six hex bolts the rear side of the notebook and four screws as showed below. Remove these hex bolts and screws.

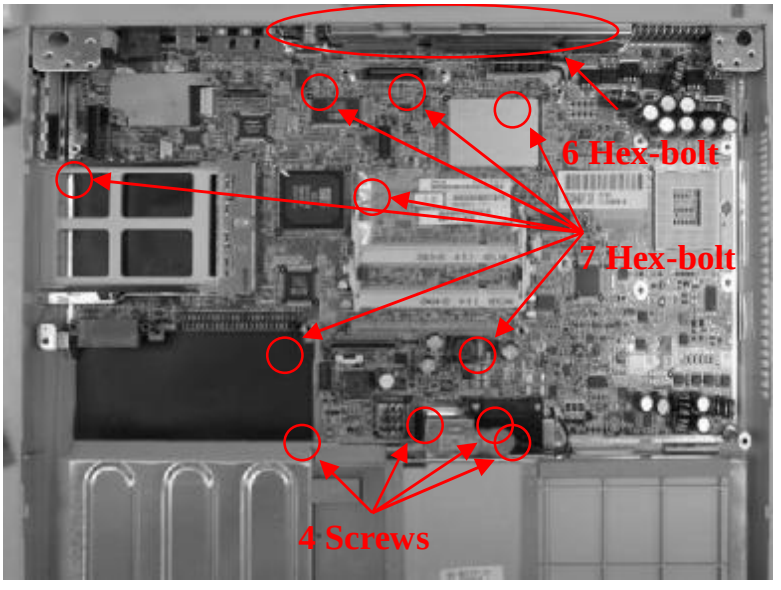


Figure 5-28 Motherboard Screws Location

3. When all screws and bolts are removed, slowly detached the motherboard from the base unit casing.

Chapter 6

Troubleshooting & Repair

6.1 Introduction

This chapter provides the most common problem encountered with the M785 notebook computer and some troubleshooting means. Some of the common problems are:

- System BIOS Related Problems
- LCD Display Problems
- System Power and Boot-Up Problems
- External Interface Problems (Serial, Printer, CRT, USB, PS/2)
- Audio Problems
- PCMCIA Problems
- Power Management Problems
- Input Device Problems (Keyboard and Glidepad)

6.1.1 Helpful Starters

Here are a few helpful starters to begin with before troubleshooting the notebook:

- Is there any external power source connected to the computer?
- Does the battery installed been fully charged?
- Is the computer turn on and the POWER LED activated?
- Are all cables connected properly and securely?
- Are all needed device drivers been installed properly?
- Is the Power Management function enabled under OS Setup? Press any key to wake system up again.

6.2 System BIOS Related Problems

This section provides you with information on how the BIOS handles errors encountered during POST (Power On Self Test) and translate them to beep codes and error messages. Refer to this whenever you encounter error messages or beep codes generated by the computer during startup.

6.2.1 POST Messages

The following is a summary of the Phoenix BIOS startup error messages that is displayed on the notebook's screen. These messages help you in understanding some of the notebook's problems that may be corrected by entering the BIOS SETUP program and checking the original values.

Table 6-1(a) POST Error Messages

Message	Possible Cause	Action
Diskette drive A failure	The drive failed or is missing. Floppy Disk Controller is disabled.	Check the drive to determine the problem. Enabled the FDD Controller.
Diskette read failure - press F1 to retry boot, F2 for SETUP utility	The diskette is either not formatted or is defective.	Replace the diskette with a bootable diskette and retry.
Display adapter failed, using alternate	The primary video adapter failed.	Check the primary video adapter.
Gate A20 failure	The keyboard controller is not accepting command, specifically, the enable and disable A20 command.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists contact qualified service personnel.
Fixed disk configuration error	The specified configuration is not supported or doesn't match the actual hardware installed.	Correct the fixed disk configuration.
Fixed disk controller failure	The fixed disk may be defective.	Try rebooting. If that doesn't work, replace the fixed disk.
Fixed disk read failure-press F1 to retry boot, F2 for SETUP utility	The fixed disk may be configured incorrectly or is defective.	Check the drive type selected in SETUP. Try rebooting. If that does not work, replace the fixed disk.
Pointer device failure	The PS/2-style mouse failed.	Try rebooting. If problem persists, check the mouse, it's cable and connector.
No boot device available - press F1 to retry boot, F2 for SETUP utility	Either diskette drive A:, the fixed disk, or both the diskette and fixed disk are defective.	Try rebooting. If problem persists, replace the diskette or the fixed disk.
No boot sector on fixed disk – press F1 to retry boot, F2 for SETUP utility	The C: drive is not formatted or is not bootable.	Format the C: drive and make it bootable.
Not a boot diskette - press F1 to retry boot, F2 for SETUP utility	The diskette in drive A: is not formatted as a bootable diskette.	Replace the diskette with a bootable diskette and try rebooting.
No timer tick interrupt	The timer chip has failed.	Check the system board, Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Shutdown failure	Either the keyboard controller is not accepting the reset command or the associated reset logic has failed.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Time of day not set - run SETUP program	Real Time Clock not set.	Run SETUP utility.

Table 6-1(b) POST Error Messages

Message	Possible Cause	Action
Timer 2 failure	The timer chip has failed.	Check the system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
F2 to enter ROM-based SETUP	Invalid configuration information must be changed.	You must run SETUP utility and correct configuration information.
Invalid configuration information - please run SETUP	Display adapter is configured incorrectly. Memory size is incorrect. Wrong number of diskette drives. Other configuration errors.	Run the SETUP utility.
Keyboard clock line failure	The keyboard, the keyboard cable connection, or the keyboard controller is defective.	Make sure the keyboard cable and keyboard are connected properly. Check the keyboard controller and the system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Keyboard data line failure	The keyboard controller firmware has failed.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Keyboard stuck key failure	A key is jammed.	Locate the jammed key and fix it. Make sure the keyboard cable and keyboard are connected properly. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Memory failure at *hex-value*, read *hex-value*, expecting *hex-value*	Circuitry associated with the memory chips has failed.	Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Unexpected interrupt in protected mode	Hardware interrupt or NMI occurred while in protected mode.	Check the timer chip or the interrupt controller on the system board.
Real time clock failure	The RTC or battery failed.	Run SETUP and turn the power off and on. If the problem persists, replace the RTC battery. If the problem remains, contact qualified service personnel.

6.2.2 Informational Messages

This section lists the messages that provide information to the user but require no action.

Table 6-2 BIOS Informational Messages

Message	Meaning
***nnn*K Base Memory**	The amount of base memory that tested successfully.
***nnn*K Extended**	The amount of extended memory that tested successfully.
Memory tests terminated by keystroke	The message indicates that a user pressed the spacebar while memory tests were running and stopped the memory tests.
Press the F1 key to continue	This message indicates that an error was found during POST. Pressing the F1 key allows the system to attempt to reboot.
Beginning memory test	A user can stop the memory tests by pressing the spacebar.
Press the F1 key to continue, F2 to run the Setup utility	This message indicates that an error was found during POST. Pressing the F1 key allows the system to attempt to boot. Press F2 allows users to run the ROM-based SETUP utility to correct configuration information.

6.2.3 Beep Codes

Beep codes are used to identify a POST error that occurs when the screen is not available. Once the screen is operating, diagnostic messages are reported to the screen. There are beep codes for both fatal and non-fatal system board errors.

> i No beep code is generated if a test is aborted while in progress. However, diagnostic cards can be installed in order to display the contents of the diagnostic port 80h and identify the area of failure.

Explanation of test terms for beep code table

The following terms are used in the Test Performed column of the beep code table:

1. **Pattern test** - One or more particular patterns are written to a location then read back from the same location. Examples of patterns used are 55h and AAh. If the value read does not match the value written, the test is considered a failure.

2. **Rolling ones test** - Several patterns are constructed. These patterns represent a one rolling through the given location. For example, to roll a one through three bits, the following patterns would be constructed: 001, 010, 011, 100, 101, 110, and 111. The patterns are written to the location and then read back, one by one. If the value read does not match the value written, the test is considered a failure.

3. **Rolling zeros test** - Several patterns are constructed. These patterns represent a zero rolling through the given location. For example, to roll a zero through three bits, the following patterns would be constructed: 011, 001, and 000. The patterns are written to the location and then read back, one by one. If the value read does not match the value written, the test is considered a failure.

4. **Checksum test** - All of the values in a given range of locations are added together. The range includes a location which when added to sum of the ranges, will produce a known result, such as zero.

Beep codes for system board errors

Table 6-3 (a) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
none	01h	CPU registers test in progress or failure	Pattern test of most of the 16-bit CPU registers. Failure will result in a system halt.
1-1-3	02h	CMOS write/read test in progress or failure.	Rolling ones test in the shutdown byte (offset 0Eh) of the CMOS RAM. Failure will result in a system halt.
1-1-4	03h	ROM BIOS checksum test in progress or failure.	The range of ROM that includes the BIOS is checksummed. Failure will result in a system halt.
1-2-1	04h	Programmable interval timer 0 test in progress or failure.	Over a period of time, the current count values in timer 0 are read and accumulated by ORing them into the values read so far. It is expected that during the time period, all bits will be set. Failure will result in a system halt.
1-2-2	05h	DMA channel 0 address and count register test in progress or failure.	Rolling ones and rolling zeros test of the address and count registers of DMA channel 0. Failure will result in a system halt.
1-2-3	06h	DMA page register write/read test in progress of failure.	Pattern test of DMA page registers. Failure will result in a system halt.
1-3-1	08h	RAM refresh verification test in progress or failure.	Over a period of time, the refresh bit (bit 4) in port 60h is read and tested. The refresh bit should toggle from 0 to 1, then 1 to 0 within the time period. Failure will result in system halt.
none	09h	First 64K RAM test in progress.	No specific test is performed - just indicates that the test is beginning.
1-3-3	0Ah	First 64K RAM chip or data line failure, multi-bit.	The first 64K of RAM is tested with a rolling ones test and a pattern test. If any of the pattern tests fail, then the BIOS reports that multiple data bits failure. Failure results in a system halt.
1-4-2	0Dh	Parity failure first 64K RAM	At the completion of the rolling ones and pattern tests of the first 64K, the BIOS checks the parity error bits (bits 7 and 6) of port 60h. Failure results in a system halt.

Table 6-3 (b) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
2-1-1 2-1-2 2-1-3 2-1-4 2-2-1 2-2-2 2-2-3 2-2-4 2-3-1 2-3-2 2-3-3 2-3-4 2-4-1 2-4-2 2-4-3 2-4-4	10h-1Fh	First 64K RAM chip or data line failure on bit x	The first 64K of RAM is tested with a rolling ones test and a pattern test. If any of the rolling ones tests fail, then the BIOS reports the specific bit that failed. To determine the bit number from the diagnostic code, subtract 10h. For example, if 12h is displayed at the diagnostic port, bit 2 failed. Failure results in a system halt.
3-3-1	20h	Slave DMA register test in progress or failure.	Pattern test of channels 1 through 3 of the slave controller (starting port address = 02h). Failure results in a system halt.
3-1-2	21h	Master DMA register test in progress or failure.	Pattern test of channels 1 through 3 of the master DMA controller (starting port address = C4h). Failure results in a system halt.
3-1-3	22h	Master interrupt mask register test in progress or failure.	Rolling ones and zeros tests of the mask register of the master programmable interrupt controller (port 21h). Failure results in a system halt.
3-1-4	23h	Slave interrupt mask register test in progress or failure.	Rolling ones and zeros tests of the mask register of the master programmable interrupt controller (port A1h). Failure results in a system halt.
none	25h	Interrupt vector loading in progress.	No specific test is performed - just indicates that the Interrupt Vector table is being initialized.
3-2-4	27h	Keyboard controller test in progress or failure.	The self-test command (AAh) is issued to the 8042 (keyboard controller) and the results are monitored. Failure results in a system halt.
None	28h	CMOS RAM power failure and checksum calculation test in progress.	The power-fail bit in CMOS RAM is tested and the lower CMOS RAM area is being checksummed. A failure does not result in system halt.
None	29h	CMOS RAM configuration validation for video in progress.	No specific test is performed - just indicates that the configuration specified in CMOS for video is being matched against the actual installation. A failure does not result in a system halt.

Table 6-3 (c) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
3-3-4	2Bh	Screen memory test in progress or failure.	The video buffers (B0000h and B8000h) are tested with a pattern test and a rolling ones test. Failure will result in a beep code but not a system halt.
3-4-1	2Ch	Screen initialization in progress.	Until the video installation is confirmed, any calls to INT 10h Function 0 (set mode) will be prefaced with the diagnostic code. There is no expected failure from this.
3-4-2	2Dh	Screen retrace test in progress or failure.	Over a period of time, the retrace bit (bit0) in the appropriate CRT controller status register (either port 3BAh or 3DAh) is read and tested. The retrace bit should toggle from 0 to 1, then 1 to 0 within the time period.
None	2Eh	Search for video ROM in progress.	No specific test is performed by the system BIOS - just indicates that the BIOS is about to jump to the initialization code in the video option ROM.
none	30h	Screen running with video ROM.	No specific test is performed - just indicates that a video option ROM was found and believed to be operating.
none	31h	Monochrome monitor operable.	No specific test is performed - just indicates that the BIOS believes a monochrome monitor is installed and is operating.
none	32h	Color monitor (40-column) operable.	No specific test is performed - just indicates that the BIOS believes a color monitor is installed and is operating. The mode has been set to 40-column as selected by the user in CMOS RAM.
none	33h	Color monitor (80-column) operable.	No specific test is performed - just indicates that the BIOS believes a color monitor is installed and is operating. The mode has been set to 80-column as selected by the user in CMOS RAM.
4-2-1	34h	Timer-tick interrupt test in progress or failure.	All interrupts expect the timer-tick interrupt are masked off at the interrupt controllers. If a timer-tick interrupt does not occur during a specific time period, an error message is displayed on the screen. The system does not halt.
4-2-2	35h	Shutdown test in progress or failure.	A return address is stored in 40:67h and the processor is reset via the keyboard controller. If a timer tick occurs during this time period, an error message is displayed on the screen. Other failures are hard to detect. If possible, the BIOS will continue with POST, skipping the memory tests.

Table 6-3 (d) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
4-2-3	36h	Gate A20 failure.	To test extended memory, the processor must be placed in protected mode and the A20 line must be enabled. For the memory tests, the BIOS generally uses the keyboard controller to enable A20. If the A20 line is not properly set during the memory test, an error message is displayed on the screen and the memory test are suspended. The system does not halt.
4-2-4	37h	Unexpected interrupt in protected mode.	During the memory tests, the processor is placed in protected mode. All interrupts in the interrupt descriptor table are initialized to point to special handler that displays a message on the screen. All hardware interrupt are disabled. The system does not halt when an unexpected interrupt occurs.
4-3-1	38h	RAM test of memory above 64K in progress or failure.	The memory above the first 64K is tested with a rolling ones test and a pattern test. All success and failure messages are displayed on the screen and POST will continue.
4-3-2	3Ah	Programmable interval timer channel 2 test in progress or failure.	Over a period of time, the current count values in timer 2 are read and accumulated by ORing them into the values read so far. It is expected that during the time period, all bits will be set. If an error is detected, an error message will be displayed on the screen and POST will continue.
4-3-4	3Bh	Real-time clock test in progress or failure.	Over a period of time, the Update-In-Progress bit of Status Register A of the real-time clock is read and tested. The bit should toggle from 0 to 1 within the time period.
4-4-1	3Ch	Serial port test in progress or failure.	Pattern test of one or more of the installed serial ports. If a failure is detected, an error message will be displayed and POST will continue.
4-4-2	3Dh	Parallel port test in progress or failure.	Rolling ones test is done to one or more of the installed parallel ports. If a failure is detected, an error message will be displayed and POST will continue.
4-4-3	3Eh	Math coprocessor test in progress or failure.	An integer load and store is performed with the math coprocessor. If the values do not match, an error message will be displayed and POST will continue.

6.2.4 Run-time Error Messages

Table 6-4 BIOS Run-time Error Messages

Message	Cause	Action
I/O card parity interrupt at *address*. Type (S)hut off NMI, (R)eboot, other keys to continue	Memory on a peripheral card has failed.	Check the memory cards installed in the system.
Memory parity interrupt at *address*. Type (S)hut off NMI, (R)eboot, other keys to continue	A memory chip(s) has failed.	Check the memory on the system board.
Unexpected HW interrupt *interrupt at address*. Type (R)eboot, other keys to continue	Hardware problem. Not displayed if the expected interrupt handler is not enabled.	Check all hardware in the system.
Unexpected SW interrupt *interrupt at address*. Type (R)eboot, other keys to continue	Error(s) in the software program. Not displayed if the extended interrupt handler is not enabled.	Turn the machine off and then on again. If doesn't work, check the program.
Unexpected type 02 interrupt at *xxxxh*. Type (S)hut off NMI, (R)eboot, other keys to continue	A parity error occurred, but the source can not be determined.	Turn the power off and then on again.

6.3 Quick Troubleshooting

This section summarizes problems that may develop during system operation and lists suggested corrective actions to isolate problem properly.

Table 6-5 (a) Quick Troubleshooting

Problem or Symptoms	Corrective Actions
No power (Power LED not on)	1. Check that the AC adapter is plugged into the DC-IN connector of the notebook. Also, that the AC adapter is plugged into a properly grounded AC power outlet. 2. If using the battery as main power source, check if the battery pack is of the right type, charged and is inserted correctly. 3. Check the internal Battery board of the notebook if it is inserted into the main board connector properly. Otherwise, replace the Battery board.
Power LED is on but no display and system does not turn on	1. Press power button for 4 seconds to reset hardware settings. Check if Power LED turns off. 2. Check memory module if it is inserted properly. Try to check also the module on the internal slot. 3. Reset CMOS RTC. 4. Replace memory module, CPU module, or Battery board.
Display on the LCD is unreadable	1. Adjust the brightness display controls. 2. Check if installed VGA driver is correct and resolution is set according to LCD size and type. 3. Check if the LCD cables are inserted properly. Check also connections inside the LCD panel. 4. Check LCD inverter board inside LCD panel if faulty. 5. Check the North Bridge chip on the main board if there is any cold or loosed soldering. 6. Replace the main board.
LCD screen does not show display	1. Check the LED Status Bar if Power Saving mode is activated. Press any key or press the power button to resume operation and display. 2. Check if the display output is switched to the external monitor. 3. Check if there is power. 4. Check if LCD cables are disconnected or loosed. 5. Replace LCD Inverter board found inside the LCD Panel.
Battery Power does not last or does not read properly under Win98 / Win Me	1. Make sure that the power management options under OS Setup are enabled and set properly. 2. Recharge the battery pack for at 3 least hours before using again. 3. Discharge and recharge the battery twice (Battery Low-Low Suspend Off) to allow more accurate reading of battery meter under Windows 98 or Windows Me. 4. Replace the battery pack.

Table 6-5 (b) Quick Troubleshooting

Problem or Symptoms	Corrective Actions
System halts during boot sequence	1. Check condition of selected boot-load device (diskette or hard disk) for bad boot track or incorrect OS files. 2. Try booting from a new bootable diskette and recopy or repartition hard disk. 3. Check for any BIOS error messages on the display. 4. Replace main board.
I/O processing malfunctions	1. Check the connections of all internal devices. 2. Replace main board.
Diskette drive does not work	1. Check if FDD option is DISABLED under BIOS Setup program. 2. Check if floppy drive cable is connected properly. 3. Check diskette type if correct and not faulty. 4. Replace diskette drive. 5. Replace main board.
Hard disk drive malfunction	1. Check if hard disk drive is set properly on BIOS SETUP. 2. Check cables and connections. 3. Check if disk drive is good. Replace the drive. 4. Replace the main board.
CD-ROM drive malfunction	1. Check if drive is set properly on BIOS Setup. 2. Check if device driver is installed properly. Do not use other CD-ROM driver. 3. Check cables and connections. 4. Replace drive or main board.
Memory malfunction	1. Check if the memory module is inserted properly. Try to insert it also to the other slot. 2. Replace the memory module. 3. Replace the main board.
External keyboard or PS/2 mouse doesn't work	1. Check if keyboard or mouse is connected properly. Check PS/2 Y-cable if it is being used. Power off system first before plugging in the device. 2. Check PS/2 mouse driver if it is installed properly. 3. Replace the keyboard or mouse. 4. Replace the main board.
PCMCIA card does not work	1. Check if the PCMCIA card is inserted properly and all cables and connections are set. 2. Check the PCMCIA card driver installation for any IRQ or IO address conflict. Try to disable the COM2 port (SIR) inside the BIOS Setup menu to free up unused IRQ. 3. If PC card is not detected, insert it to the other PCMCIA slot. Otherwise, replace PC card. 4. Contact the PC card manufacturer for support. 5. Replace the main board.

Table 6-5 (c) Quick Troubleshooting

Problem or Symptoms	Corrective Actions
Glide pad does not work	1. Check if PS/2 mouse driver is properly installed. Remove any external PS/2 mouse. 2. Check the glide pad cable inside the system if it is inserted properly. 3. Replace the glide pad module. 4. Check the keyboard controller chip for any cold or loosed soldering. 5. Replace the main board.
Serial device does not work	1. Check if Serial Port is set to ENABLED under BIOS Setup program (Advanced menu). 2. Check if serial device is connected properly. 3. If using serial mouse, check if internal glide pad is disabled under BIOS Setup. On Windows 98 or Me, check if it detects the serial mouse in System Device Manager under the Control Panel. 4. Check if mouse driver is installed properly. 5. Replace serial device. 6. Check the South Bridge chip on the main board for any cold or loosed soldering. 7. Replace the main board.
Parallel device does not work	1. Check if Printer is set to ENABLED under BIOS Setup program (Advanced menu). 2. Check if all connections are properly set. 3. Check if external device is turned on. 4. Check if Printer Mode is set properly. 5. Check the South Bridge chip on the main board for any cold or loosed soldering. 6. Replace the main board.
USB Port does not work	1. Check if USB port option under BIOS Setup is ENABLED. 2. Check if USB device connection is OK. Unplug and re-plug the device. 3. Check if the USB port driver and the USB device driver are installed. 4. Replace USB device or contact USB device manufacturer for support. 5. Replace main board.
Audio components does not work	1. Check external connections if OK and volume mixer is set properly. 2. Check audio source (CD, tape, etc.) if faulty. 3. Check if audio driver is installed. 4. Check internal connections for speaker and microphone if not working. 5. Check audio board, cables and connections. 6. Replace main board

6.4 Component-Level Troubleshooting

This section provides an easy to follow flowcharts for performing component-level troubleshooting on the M785 notebook.

6.4.1 General Overview

The component-level troubleshooting is broken down as follows:

Troubleshooting Item	Figure
Starting Check	Figure 6-1
Memory Interface Check	Figure 6-2
CRT Interface Check	Figure 6-3
HDD Interface Check	Figure 6-4
Internal Keyboard Interface Check	Figure 6-5
Glide Pad Interface Check	Figure 6-6
CD-ROM Interface Check	Figure 6-7
Serial Port Interface Check	Figure 6-8
External Keyboard Interface Check	Figure 6-9
PS/2 Mouse Interface Check	Figure 6-10
Printer Port Interface Check	Figure 6-11
Audio Port Interface Check	Figure 6-12
PCMCIA Interface Check	Figure 6-13
USB Port Interface Check	Figure 6-14
LCD Panel Interface Check	Figure 6-15
TV-OUT Interface Check	Figure 6-16
LED Indicator Function Check	Figure 6-17
Cover Switch Function Check	Figure 6-18
Mini-PCI Modem, LAN, or Combo Device Check	Figure 6-19
FIR Interface Check	Figure 6-20
IEEE1394 Interface Check	Figure 6-21

6.4.2 Starting Check

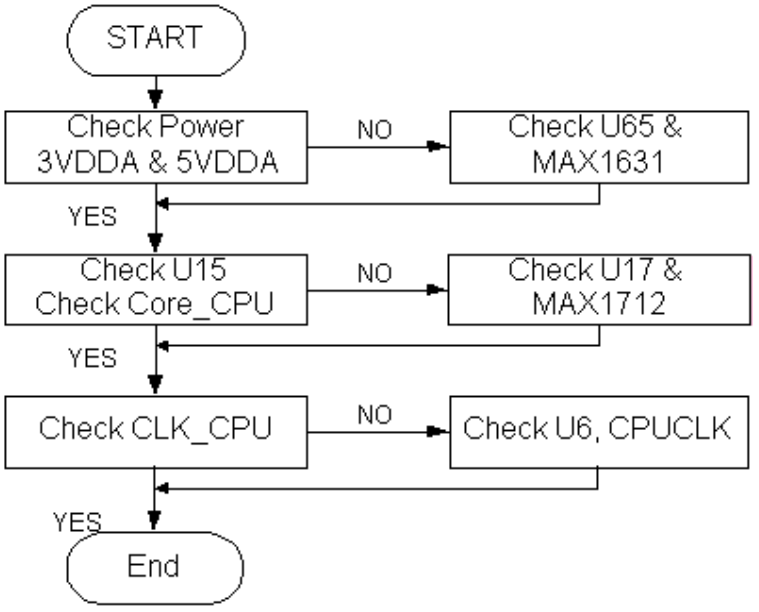


Figure 6-1 Starting Check

6.4.3 Memory Interface Check

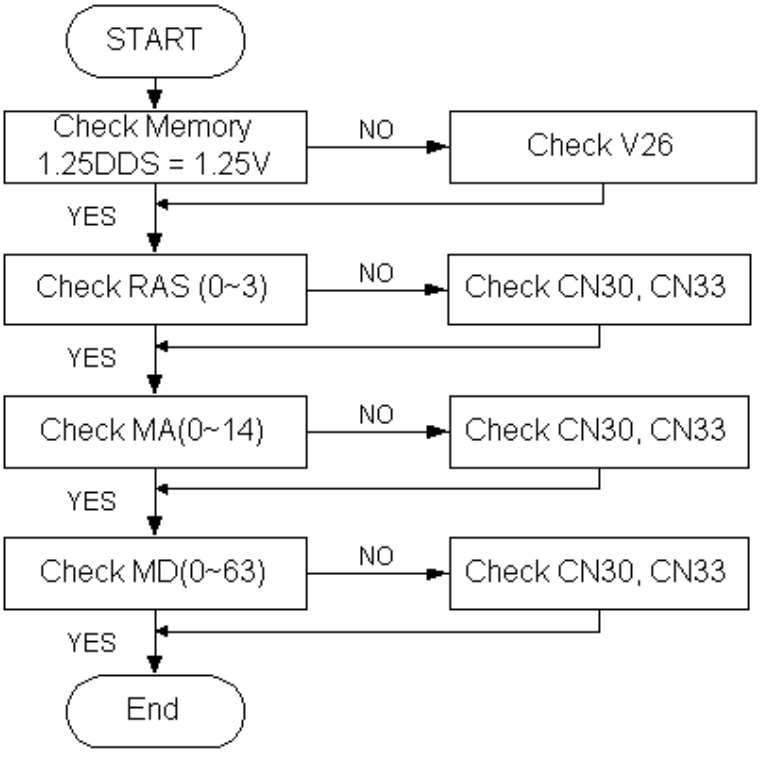


Figure 6-2 Memory Interface Check

6.4.4 CRT Interface Check

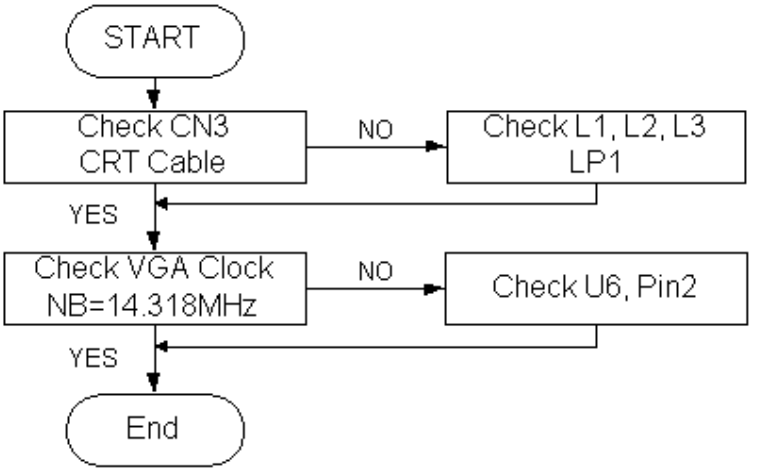


Figure 6-3 CRT Interface Check

6.4.5 HDD Interface Check

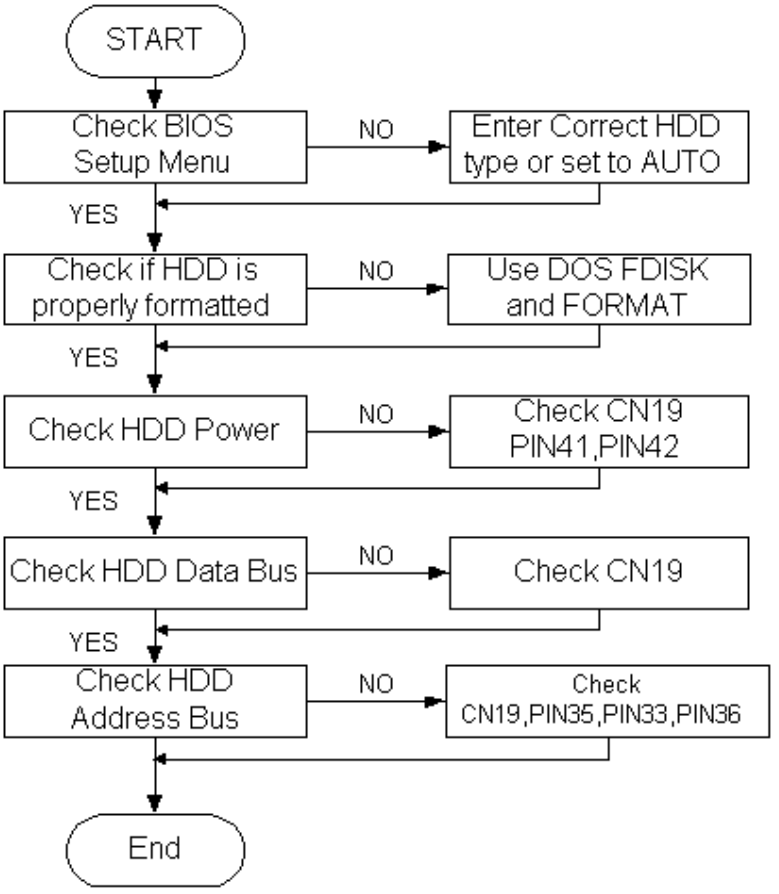


Figure 6-4 HDD Interface Check

6.4.6 Internal Keyboard Check

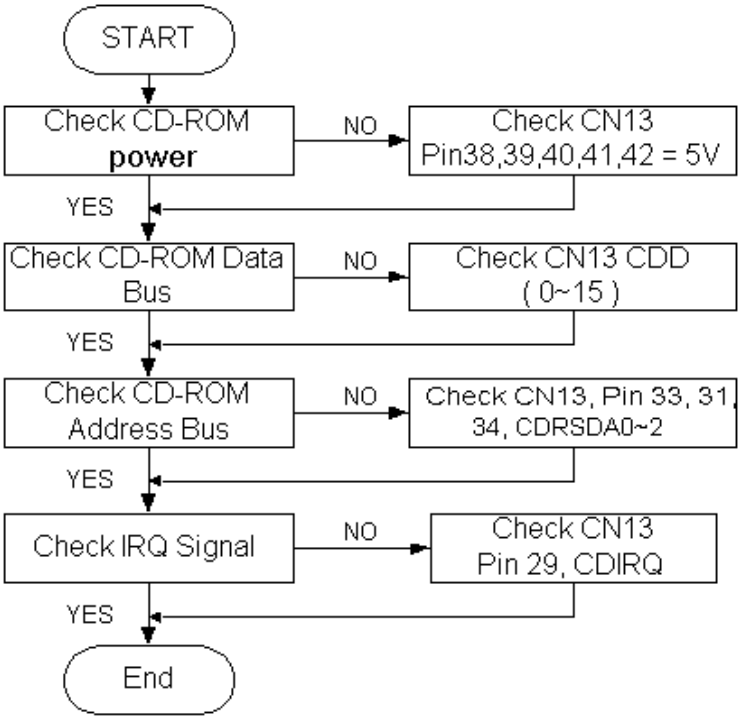


Figure 6-5 Internal Keyboard Check

6.4.7 Glidepad Interface Check

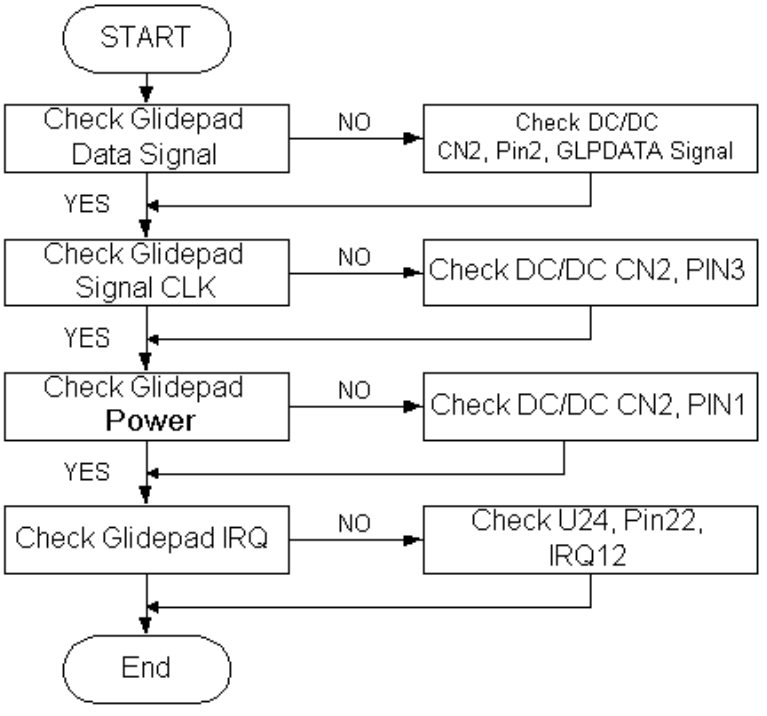


Figure 6-6 Glidepad Interface Check

6.4.8 CD-ROM Interface Check

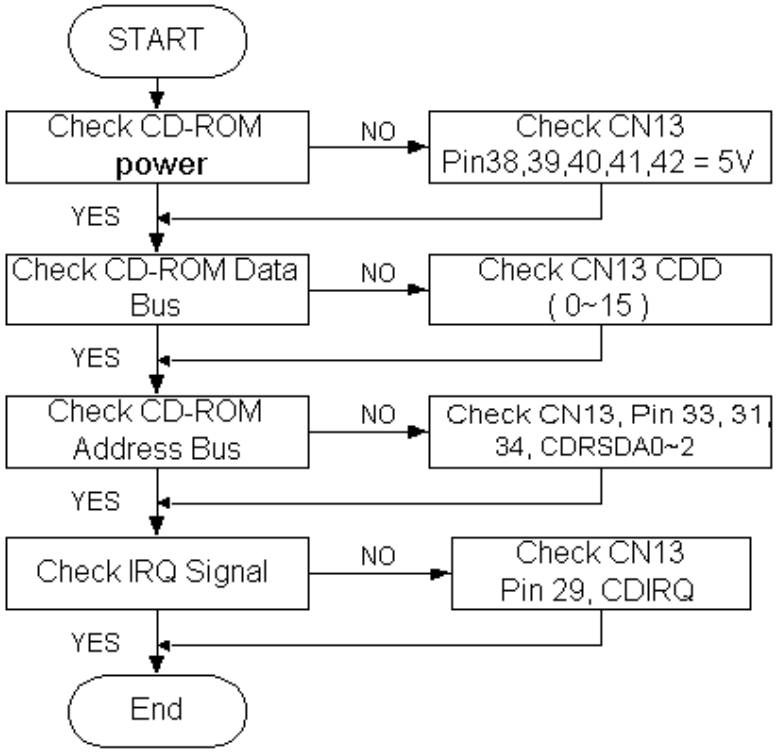


Figure 6-7 CD-ROM Interface Check

6.4.9 Serial Port Interface Check

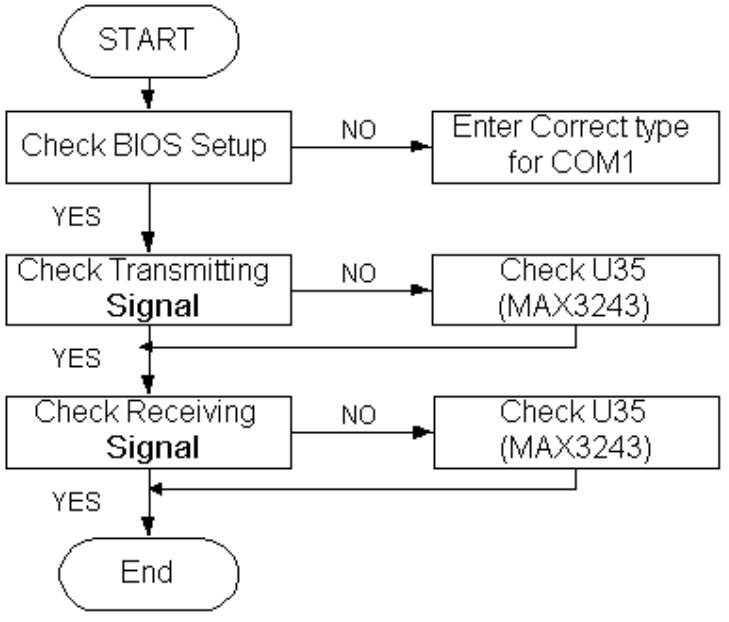


Figure 6-8 Serial Port Interface Check

6.4.10 External Keyboard Check

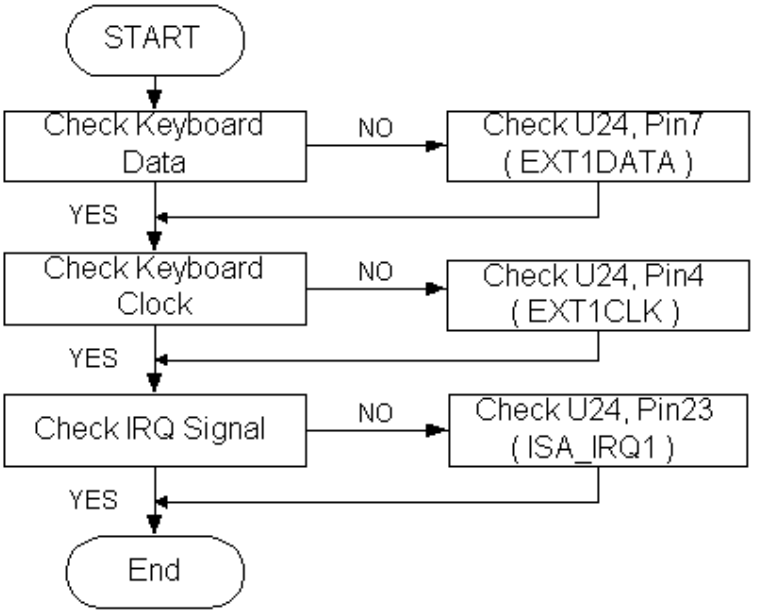


Figure 6-9 Internal Keyboard Check

6.4.11 PS/2 Mouse Interface Check

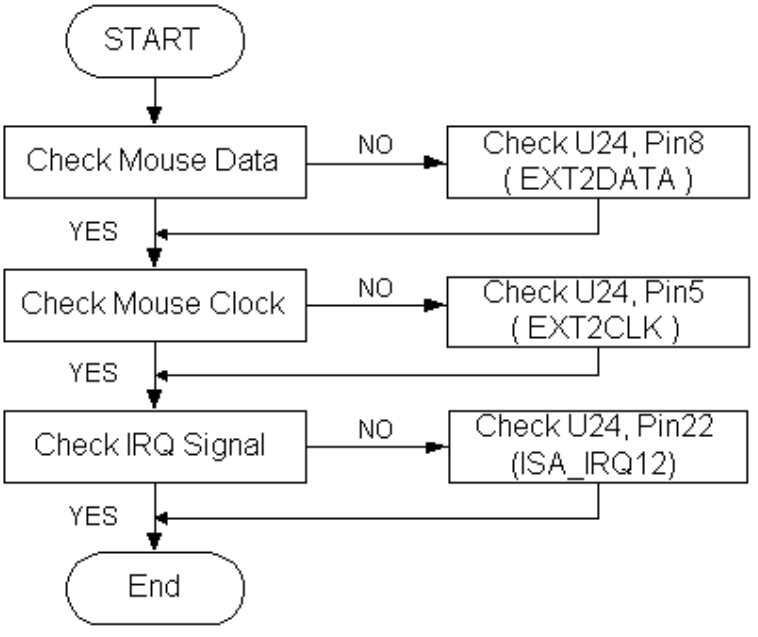


Figure 6-10 PS/2 Mouse Inteface Check

6.4.12 Printer Port Interface Check

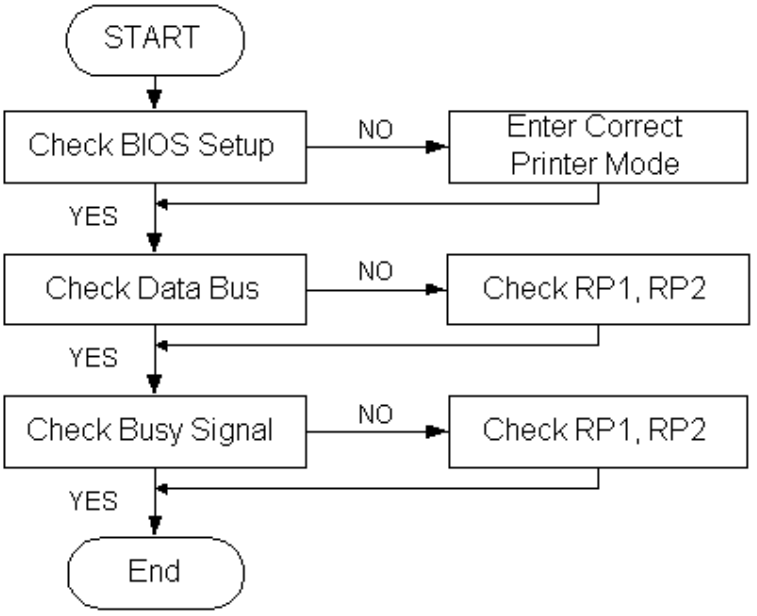


Figure 6-11 Printer Port Interface Check

6.4.13 Audio Port Interface Check

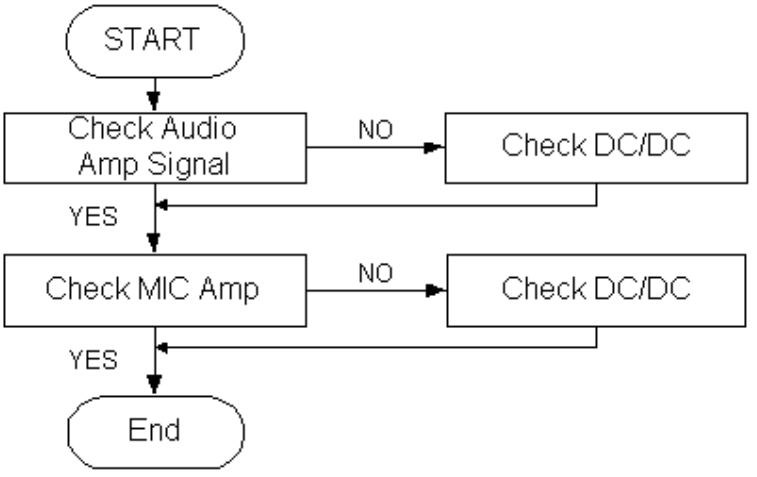


Figure 6-12 Audio Port Interface Check

6.4.14 PCMCIA Interface Check

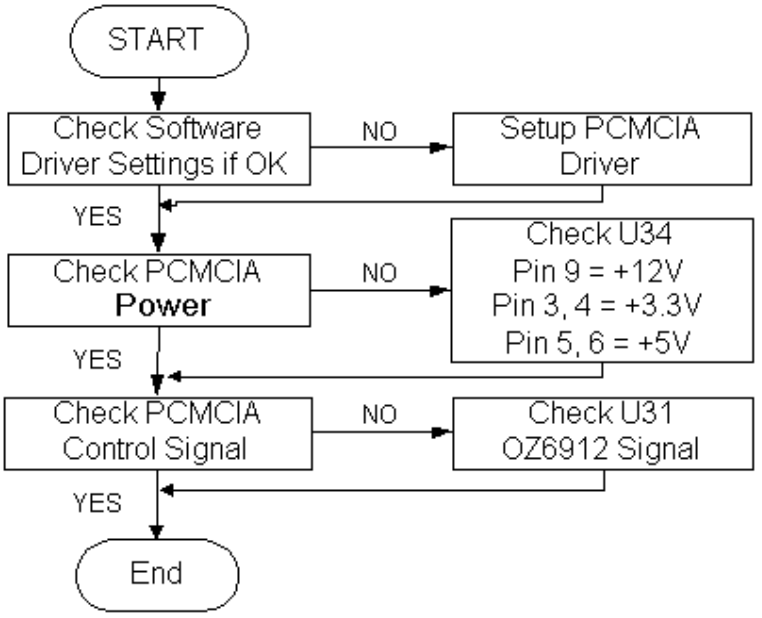


Figure 6-13 PCMCIA Interface Check

6.4.15 USB Port Interface Check

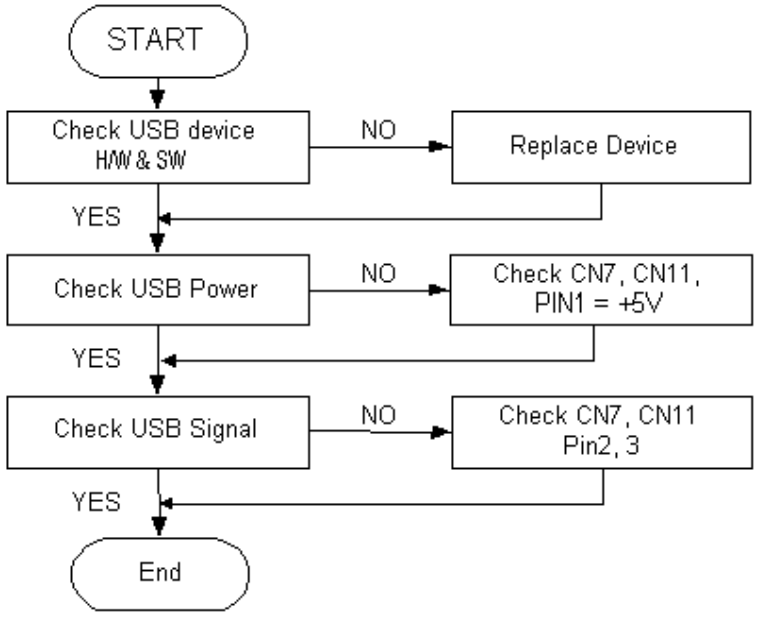


Figure 6-14 USB Port Interface Check

6.4.16 LCD Panel Interface Check

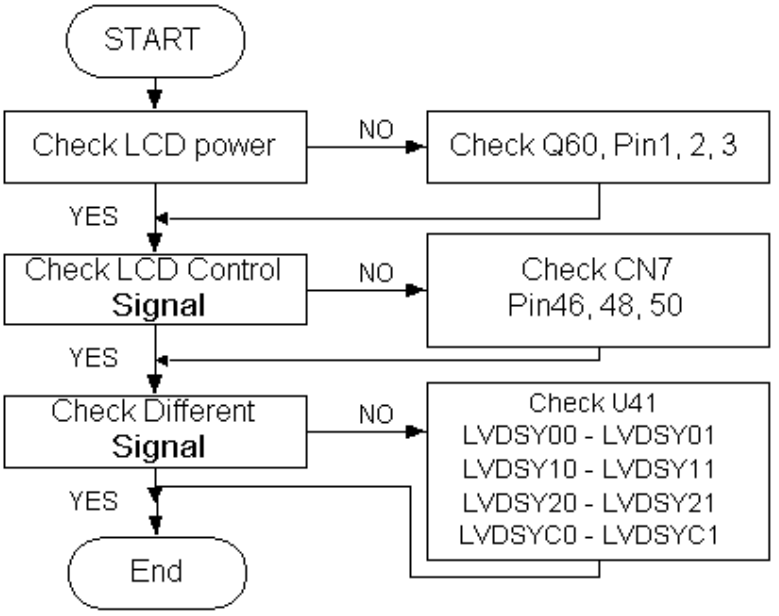


Figure 6-15 LCD Panel Interface Check

6.4.17 TV-Out Interface Check

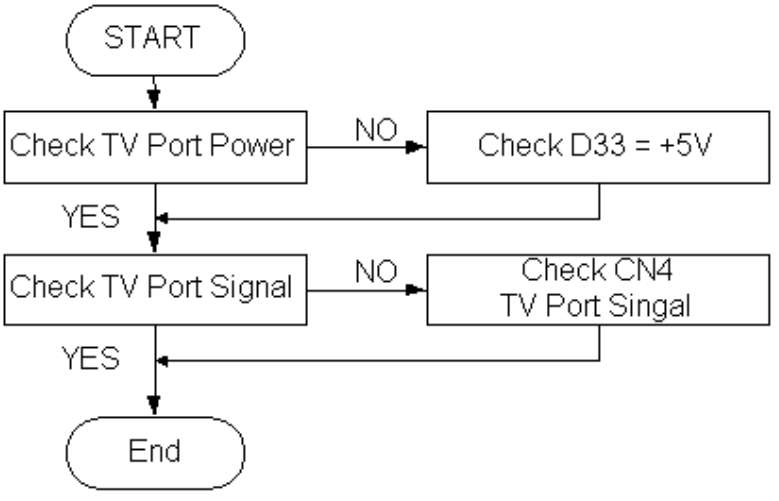


Figure 6-16 TV-Out Interface Check

6.4.18 LED Indicator Function Check

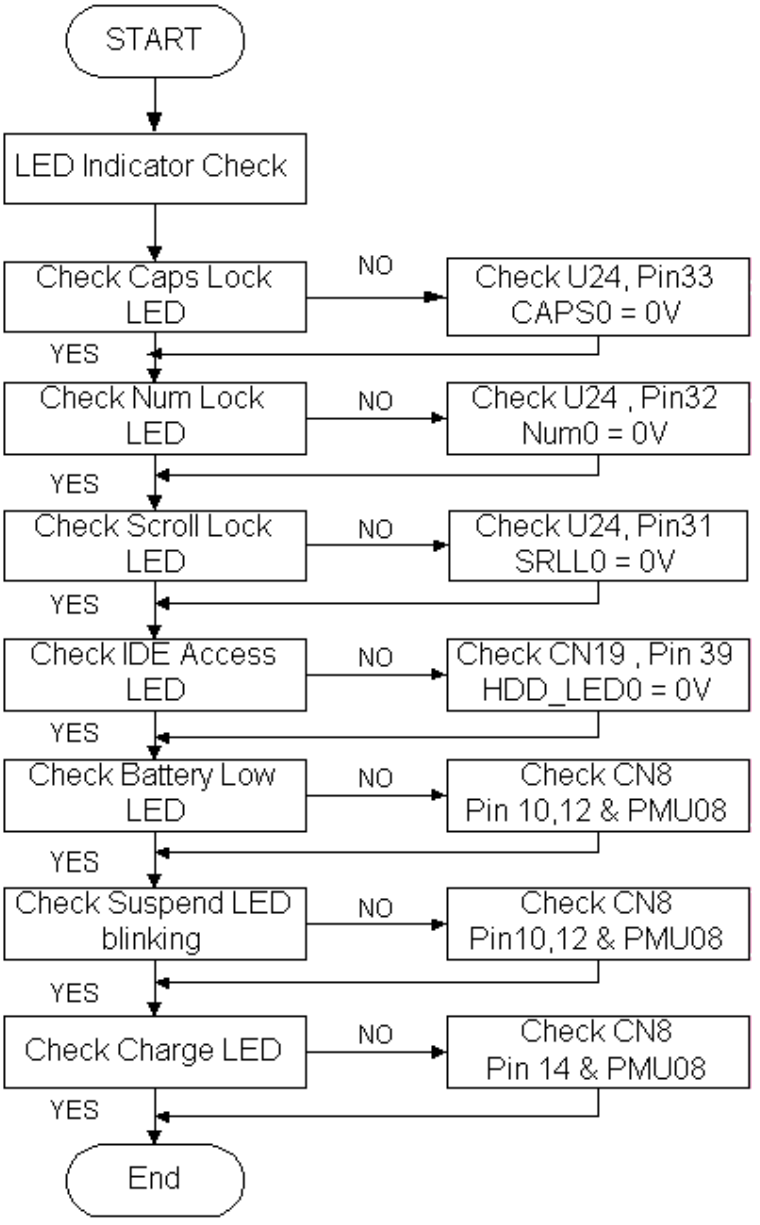


Figure 6-17 LED Indicator Function Check

6.4.19 Cover Switch Function Check

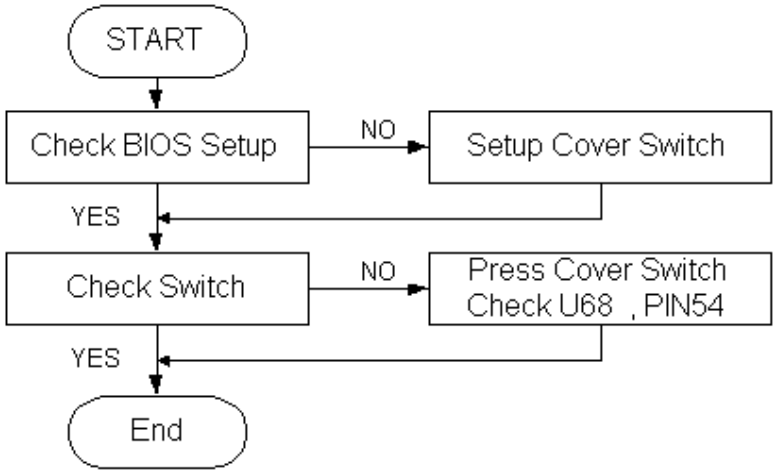


Figure 6-18 Cover Switch Function Check

6.4.20 Mini-PCI Modem , LAN, or Combo Device Check

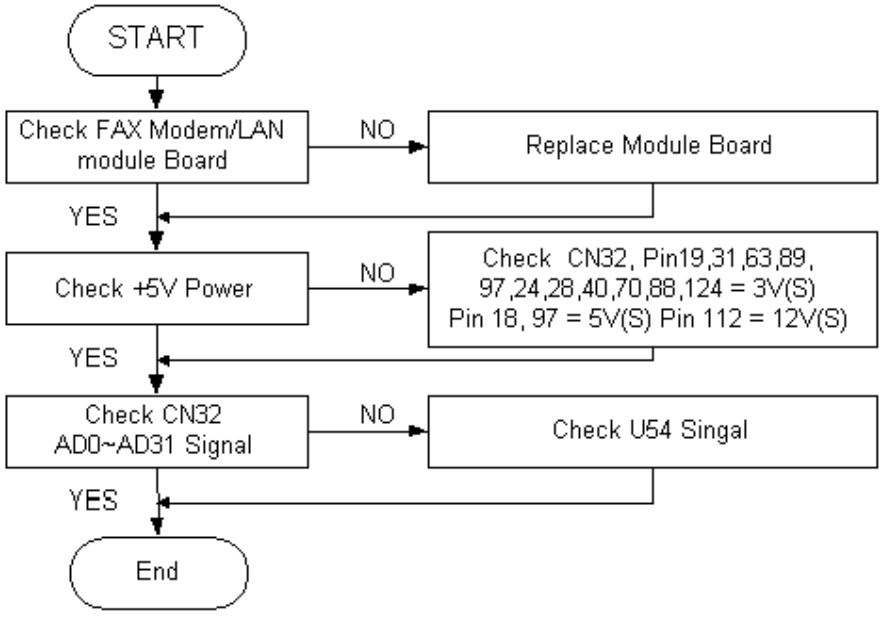


Figure 6-19 Mini-PCI Modem, LAN, or Combo Device Check

6.4.21 FIR Interface Check

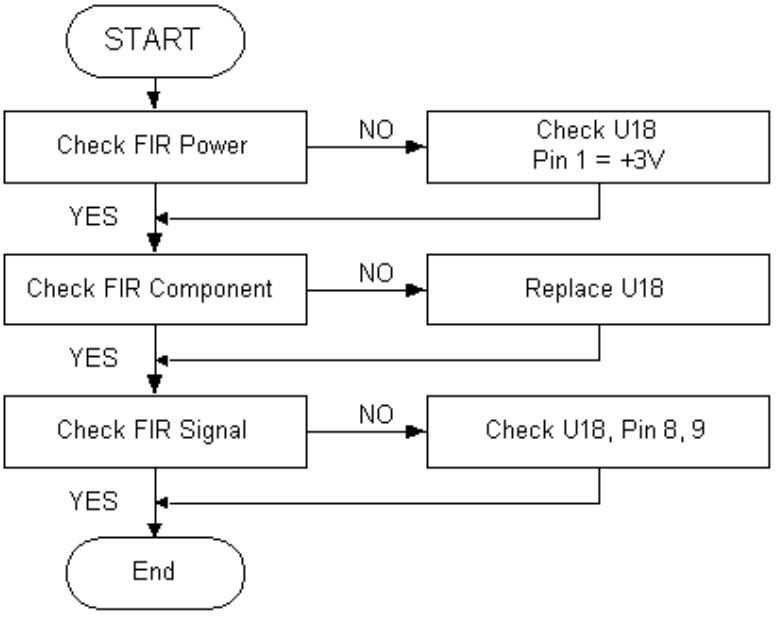


Figure 6-20 FIR Interface Check

6.4.22 IEEE1394 Interface Check

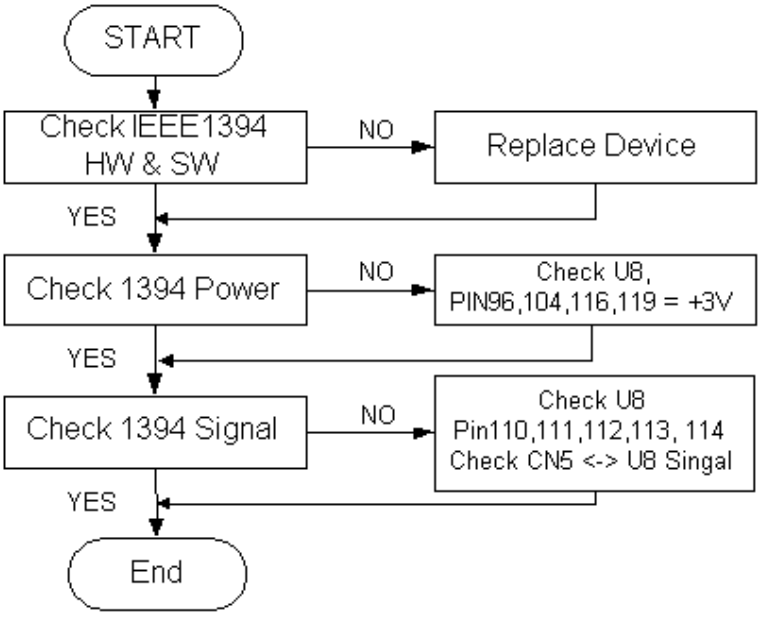


Figure 6-21 IEEE1394 Interface Check

Appendix

A

Notebook Specification

This appendix provides the technical specification of the M785 notebook:

A.1 System Specification

MICRO PROCESSOR	
CPU Type	Intel DT Pentium-4 Northwood Processor
Clock Speed	DT Pentium-4 CPU at 2.0/2.2/2.26/2.4/2.53GHz
Internal L1 Cache	64KB
Internal L2 Cache	512 KB
CPU Package	uFCPGA packaging
SYSTEM LOGIC CHIPSET	
Chipset Type	• SIS 650 - North Bridge • SIS 962 - South Bridge
Thermal controller	Integrated in South Bridge
MEMORY MODULE	
Package	DDR-SO-DIMM (1.25")
Size	128 / 256 / 512MB
Mode	DDR SDRAM
Frequency	266 MHz (Northwood)
Data Path	64 Bit
Refresh	CBR Refresh
Supply Voltage	2.5V
Extension	Upgradable to max. 1024MB using 512 MB SODIMM x 2
Parity Support	No parity bit for all memory

BIOS ROM	
ROM Type	512K x 8 CMOS Flash Memory – 49LF040A (SST)
ROM Size	4M-bit
Boot Code Sector	64KB Top Sector
Package	32-pin lead PLCC Package
Erase / Program	• 70 ms (typical) Chip-Erase Time • 18 ms (typical) Sector-Erase / Block-Erase Time • 14 us (typical) Byte-Program Time • 8 seconds (typical) Chip-Rewrite Time • Single-Pulse Program or Erase
Program Voltage	3.0V~3.6V
Supply Current	• Active = 6mA (typical) • Standby = 10uA (typical)

Notebook Specification

VIDEO SUBSYSTEM	
Video Chipset	SIS 650 (Integrate in North Bridge)
Video RAM	Shared from System Memory of 8MB up to 64MB
Bus Interface	• 66Mhz Host-to-PCI Bridge • A.G.P. v2.0 Compliant
Addressing	Linear Addressing
3D engine clock speed	Up to 143 Mhz
Maximum Resolution at CRT	1800 x 1400 at 32-bit color (16 million colors)
Maximum Color at CRT	32-bit color (16 million colors)
External CRT connector	15-pin D-Sub female
I/O SUBSYSTEM	
I/O Controller	SMSC LPC47N267
Parallel / Printer Port (LPT1)	25-pin D-sub female connector (with EPP/ECP support)
Serial / COM Port (COM1)	• Type: 9-pin D-sub male RS-232 connector • Baud Rate: 300 – 38400 bps (UART 16C550A) • Drivers / Receiver: Maxim MAX3243 (SSOP, 28-pin)
KEYBOARD SUBSYSTEM	
Keyboard Controller	ENE KB38867
Firmware Version	Version: 1.47
Package	64-pin TQFP
Host Interface	8042-style host interface
Keyboard Scan	Local 16 x 8 keyboard switch matrix
External PS/2 Keyboard	Mini-DIN PS/2 connector

SOUND SUBSYSTEM	
Audio Controller	Integrated in South Bridge
Audio Codec	ALC 201 CODEC (Analog Devices)
Compatibility	Sound Blaster 16 (Pro) & AC'97 Revision 2.2
Wavetable Function	Software
Connection	Full-Duplex
Volume	Analog H/W Volume
Built-in Speaker	2-way (left and right) mini stereo 1W 8Ω speakers
Built-in Microphone	Mono
Line-Out Jack	1 x line-out jack with 50mW/20ohm driving capability supported S/PDIF out
Microphone Jack	1 x 3.5p microphone jack with 50mW/20ohm driving capability
POINTING DEVICE SUBSYSTEM	
Chipset Controller	Mitsubishi M38867E4HP Version 1.47
Package	64-pin TQFP
Touchpad Type	Synaptics TM41PDG351-1 Glide Point
Interface	PS/2
External PS/2 Mouse	Mini-DIN PS/2 connector (share with PS/2 keyboard)

Notebook Specification

PCMCIA SUBSYSTEM	
Chipset Controller	ENE CB1410 PCI-cardbus bridge
PCMCIA Slot Configuration	1 Type I or Type II
Bus Type	32-bit PCI CardBus
Compatibility	Yenta ™ PCI to PCMCIA CardBus Bridge Registers
Compliance	ACPI-PCI Bus Power Management Interface Spec Rev 1.1
POWER MANAGEMENT UNIT (PMU)	
PMU Controller	Mitsubishi M38859FFHP (PMU08)
PMU Modes	Video Timeout, Hard Disk Timeout, Suspend to RAM (STR) mode, Suspend to Disk (STD) mode
Others	LCD Cover-Switch STR, ACPI, DMI 2.0, Thermal Control
STATUS LED INDICATORS	
Number of LEDs	7 LEDs
Power Status LED	Green color when powering on Green color blinking when in STR or STD Amber color in Battery Low.
Battery Charge LED	Green color in charging status Lights off when the battery is fully charged or no battery installed
Internet / Mail LED	Green color blinking when a new mail is arriving
HDD LED	Green color when accessing the HDD
FDD LED	Green color when accessing the FDD
Num Lock LED	Green color for Num Lock activate on keyboard
Caps Lock LED	Green color for Caps Lock activate on keyboard
Scroll Lock LED	Green color for Scroll Lock activate on keyboard

HOT-KEY DEFINITION	
Number of hot-keys	8 <Fn> key combinations
Display Mode	Fn + F3 (LCD/ CRT/ TV/ LCD&CRT)
PC Speaker On / Off (Mute)	Fn + F6
Brightness Up	Fn + F8
Brightness Down	Fn + F9
Internet Function Key	Internet Button
Mail Function Key	Mail Button

A.2 Display Specification

14.1" XGA TFT LCD (HYDIX)	
LCD Model	HT141X14-101
LCD Type	14.1" XGA TFT
Display Area	H285.696 x V214.272 [mm]
Display Pixels	H1024 x V768 pixels
Pixel Pitch	H0.279 x H0.279 [mm]
Display colors	262K Colors
Module Size	298.5(W) x 227.5(H) x 5.8(D) [mm]
Weight	Approx. 550g
Contrast Ratio	200:1 (typ.)
Power Supply	3.3V
Response Time	30ms (max)
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius
15.0" SXGA TFT LCD (HANNSTAR)	
LCD Model	HSD150PX14-A
LCD Type	15.0" SXGA+ TFT
Active Area	H304.1 x V228.1 [mm]
Display Pixels	H1400 x V1050 pixels
Pixel Pitch	0.218 [mm]
Display colors	262K Colors
Module Size	315.7(W) x 240.5(H) x 7(D) [mm]
Weight	Approx. 650g
Contrast Ratio	250:1 (typ.)
Brightness	150 (cd/m^2)
Viewing Angle (U/D/L/R)	10/30/45/45
Power Supply	3.3V
Response Time	40ms (max)
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius

A.3 DVD/CD-RW Combo Drive Specification

Drive Manufacturer	QSI SBW-161
Physical Dimension	128.0 x 12.7 x 129 [mm] (W * H * D)
Weight	300g
Loading	Manual tray loading
Ejection	Manual eject using the eject button Auto eject using the eject command on software
Host Interface	Enhanced IDE (ATAPI)
Access Time (1/3 stroke)	DVD-ROM 180ms Typ. CD-ROM 130ms Typ.

Data Transfer Rate (ATAPI Interface)	16.7 MByte/s (PIO Mode 4) 16.7 MByte/s (Multi word DMA transfer mode-2) 33.3 MByte/s (Ultra DMA transfer mode-2)
Data Transfer Rate (sustained)	Max. 10,800Kbyte/s (DVD); Max.3,600Kbyte/s(CD)
Data Write Rate	Max. 1,200Kbyte/s (CD-R) ; Max.600Kbyte/s(CD-RW)
Starting Time	Max. 15 sec (Except Multi Session)
Stop Time	Max. 6 sec (Except DVD-RAM)
Data Buffer Capacity	2MB
Supply Voltage	+5VDC +/- 0.25V
MTBF	60,000H (Duty 20%)

A.4 Keyboard Specification

Keyboard Type	JME K9801
Type of key switch	Membrane (PE) Switch
Number of keys	87 keys with embedded numeric keypad
Compatibility	Enhanced 101/102 emulation
Travel	3.0 mm ± 0.3 mm
Keyboard Height	6.8 ± 0.3 mm 7.0 ± 0.3 mm (SPACE Key)
Keycap Pull Off Force	≥ 500g
Supply Voltage	6V
Operating Temperature	-10 to 60 degrees Celsius

A.5 Touch Pad Specification

Touch Pad Type	Synaptics GlidePoint TM41PDG351-1
Interface	PS/2 (compatible with Microsoft Mouse Driver)
Supply Voltage	5V
Supply Current	4.0mA (Max) Operating
Dimension	W65 x H49 x D2.82 (D1.07 PCB) mm
Weight	8g.
Operating Temperature	0 to 60 degrees Celsius
Storage Temperature	-40 to 65 degrees Celsius

A.6 Internal Modem Specification

Modem Type	MDC FAX/MODEM UNIT
Chipset	Lucent Mars3 1648
Modem Chipset Interface	MDC
Wake Up Function	Supports Ring-in Resume Wake Up function
Connection Mode	V.90 Kbps
Speakerphone	Full duplex speakerphone (FDSP)
Fax Transmission Way	Half Duplex
Modem Speed	56 Kbps

Modulation Format	V.90 PCM

A.7 Internal LAN Specification

LAN Type	ICS 1893AF
LAN Chip Interface	On-Board
Speed	10/100 Mbps Auto-Negotiation
Wake Up Function	Supports Wake-on-LAN (WOL) & LAN-BOOT function

A.8 Power Supply

AC POWER ADAPTER (LITEON)	
Adapter Type	ADP-65DB
Input Voltage	100 to 240VAC
Input Frequency	50 to 60 Hz
Input Current	1.5A Max at 110VAC 0.7A Max at 220VAC
Efficiency	83% Min with the AC input set at 115v/50Hz
In-Rush Current (Cold Start)	50A Max at 100 VAC 100A Max at 240 VAC
Output Power	90W
Output Voltage	+19Vdc (main)
Output Current Limit	5.2A~6.0A
Over Voltage Protection	25V Max
Over Temperature protection	110~130 degree C
LED Display	Green LED (On / Off)
Dimension	L133 x W58 x H29 [mm]
LITHIUM ION (LI-ION) BATTERY PACK	
Model	Sanyo Li-Ion Rechargeable Smart Battery
Cell Number	8
Rating (Nominal) Voltage	14.8V
Typical Capacity	4000 mAH
Watts	51.84 W
Charging Voltage	16.8V
Charging Efficiency	100%
EVD1	14.0V
EVDF	12.0V

A.9 Inverter Specification

Input Voltage	5.0V
Start Voltage	1200Vrms (min)
Output Current	6mA (max)
Frequency	30~70KHz

Efficiency	75% (min)
Brightness Control Voltage	0.94~1.86V

A.10 DC/DC Specification

Controller	MAX1631
Input Voltage	8 ~ 20V
Output Current	7A (5V) / 4.5A (3.3V) / 120mA (12V)
Frequency	200KHz
Support Mode	OVP / OCP

A.11 Charger Specification

LITHIUM ION (LI-ION) BATTERY PACK	
Max. Temperature	60 degrees
Controller	Mitsubishi 3886X
Input Voltage	18.5 ~ 20V
Max. Charger Voltage	4.35V / cell
Charger Entry Temperature	0 – 50 degrees
Max. Timer	300 minutes
Trickle Charger Detect	0 < V < 3V / cell
Output Current (system off)	1.6A (Min) / 1.7A (Typ) / 1.8A (Max)
Output Current (system on)	constant power
Trickle Charger Current	120mA
Ripple & Noise	500mV
Efficiency	90%

A.12 Mechanical Specification

Unit Dimensions (W x D x H) in millimeters	330 x 280 x 42 mm (Front)
Unit Weight	Approximately 3.5Kg (8 lbs) with 14.1” LCD System with HDD, FDD, CD-Rom & One Li-Ion Battery Pack

A.13 Environmental Requirements

Temperature Operating Temperature Storage Temperature	 0^{o}C to 40^{o}C -20^{o}C to 60^{o}C
Humidity Operating & Storage	 40^{o}C / 85% RH Over 48 hours

Shock (Non-operating) Unpacked	Acceleration: 50G Duration Time: 11ms No. of Times: 3 Times Direction: 6 face
Drop Package	Drop Height: 91cm (under 10Kg) 76cm (over 10Kg) Drop Phase: 1 corner, 3 line, 6 face
Electro-Static Discharge (ESD)	Contact: +/- 6KV Air: +/- 10KV

Appendix C

FRU Parts Listing

This appendix provides you with the field replaceable unit (FRU) parts listing of the A985 Series. Refer to this appendix whenever ordering for spare parts or requesting for RMA (Returned Merchandise Authorization) number. Please contact FIC account manager for latest unit price.

ITEM	FRU	FRU Level			FIC Part Number	Lead Time (days)	Warranty Period	Return to FIC/Customer for Repair
		A	B	C				
1	CPU P4-2.0G INTEL	x			01-10904-01	40	N/A	N/A
2	CPU P4-2.26G INTEL	x			01-10900-01	40	N/A	N/A
3	CPU P4-2.4G INTEL	x			01-10899-01	40	N/A	N/A
4	DDRAM-M128M/PC-33 Kingmax	x			02-33027-00	60	N/A	N/A
5	DDRAM-M128M/PC-33 Apacer	x			02-33028-01	60	N/A	N/A
6	DDRAM-M 256M/PC-133 Kingmax	x			02-33030-00	60	N/A	N/A
7	DDRAM-M 256M/PC-133 Apacer	x			02-33031-01	60	N/A	N/A
8	DDRAM-M 256M/PC-133 UniApacer	x			02-33037-01	60	N/A	N/A
9	Module - DVD-ROM 8X QSI	x			25-03179-00	N/A	N/A	N/A
10	DVD-ROM 8X QSI			x	23-40293-10	60	12 Mth	FIC
11	CD-ROM BRACKET L1			x	24-51915-01	30	N/A	N/A
12	PLASTIC-M DVD-ROM PANEL			x	80-40719-00	30	N/A	N/A
13	Module - DVD-ROM 8X Liteon	x			25-03179-50	N/A	N/A	N/A
14	DVD-ROM 8X lite-on				23-40455-00	60	12 Mth	FIC
15	CD-ROM BRACKET L1				24-51915-01	30	N/A	N/A
16	PLASTIC-M DVD-ROM PANEL				80-40730-00	30	N/A	N/A
17	Module - DVD/CD-RW COMBO QSI	x			25-03180-00	N/A	N/A	N/A
18	DVD/CD-RW COMBO SBW-161 QSI			x	23-40421-01	60	12 Mth	FIC
19	CD-ROM BRACKET			x	24-51915-01	30	N/A	N/A
20	PLASTIC-M DVD-ROM BEZEL			x	80-40719-0A			
21	Module HDD _20GB _HIT	x			25-03174-00	N/A	N/A	N/A
22	HDD 20GB HIT			x	23-20822-03	N/A	12 Mth	FIC
23	CON ALL C16805 44PIN			x	20-24321-00	30	N/A	N/A
24	FRAME HDD			x	24-51297-00	30	N/A	N/A
25	Module HDD _20GB _FUJ	x			25-03174-10	N/A	N/A	N/A
26	HDD 20GB FUJ			x	23-20855-02	N/A	12 Mth	FIC
27	CON ALL C16805 44PIN			x	20-24321-00	30	N/A	N/A
28	FRAME HDD			x	24-51291-00	30	N/A	N/A
29	Module HDD _30GB _HIT	x			25-03181-00	N/A	N/A	N/A
30	HDD 30GB HIT			x	23-20813-06	N/A	12 Mth	FIC
31	CON ALL C16805 44PIN			x	20-24321-00	30	N/A	N/A
32	FRAME HDD			x	24-51921-00	30	N/A	N/A
33	Module HDD _30GB _FUJ	x			25-03181-10	N/A	N/A	N/A

FRU Parts Listing

ITEM	FRU	FRU Level			FIC Part Number	Lead Time (days)	Warranty Period	Return to FIC/Customer for Repair
		A	B	C				
34	HDD 30GB FUJ			x	23-20754-03	N/A	12 Mth	FIC
35	CON ALL C16805 44PIN			x	20-24321-00	30	N/A	N/A
36	FRAME HDD			x	24-51921-00	30	N/A	N/A
37	Module HDD _40GB _HIT	x			25-03182-00	N/A	N/A	N/A
38	HDD 40GB HIT			x	23-20862-03	N/A	12 Mth	FIC
39	CON ALL C16805 44PIN			x	20-24321-00	30	N/A	N/A
40	FRAME HDD			x	24-51921-00	30	N/A	N/A
41	Module HDD _40GB _FUJ	x			25-03182-10	N/A	N/A	N/A
42	HDD 40GB FUJ			x	23-20935-00	N/A	12 Mth	FIC
43	CON ALL C16805 44PIN			x	20-24321-00	30	N/A	N/A
44	FRAME HDD			x	24-51921-00	30	N/A	N/A
45	Module HDD _60GB _HIT	x			25-03183-00	N/A	N/A	N/A
46	HDD 60GB HIT			x	23-20900-00	45	12 Mth	FIC
47	CON ALL C16805 44PIN			x	20-24321-00	30	N/A	N/A
48	FRAME HDD			x	24-51921-00	30	N/A	N/A
49	USB FDD (uf0002s-106) NEC	x			25-02373-03	45	N/A	N/A
50	Battery Pack LI-LON 4000MA(sanyo)	x			21-92093-11	90	5 Mth	FIC
51	Battery Pack LI-LON 4000MA(panasonic)	x			21-92093-12	90	5 Mth	FIC
52	FAX MODEM MODULE (ASKEY)			x	71-40183-00	N/A	12 Mth	FIC
53	CABLE-M MODEM			x	22-10895-00	N/A	N/A	N/A
54	Main Module	x			56-20770-50	N/A	N/A	N/A
55	Main Board			x	51-71456-02	30	12 Mth	FIC
56	LED/B			x	51-71389-02	30	12 Mth	FIC
57	FPC CCABLE LED/B TO MB			x	22-21279-00	30	N/A	N/A
58	Audio jack Board			x	51-71391-02	30	12 Mth	FIC
59	BAT RTC			x	21-91086-00	30	N/A	N/A
60	HEAT SINK			x	24-20668-00	30	N/A	N/A
61	CASE HINGE COVER-L			x	24-45480-00	30	N/A	N/A
62	CASE HINGE COVER-R			x	24-45481-00	30	N/A	N/A
63	BOTTOM CASE MODULE W/O PCMCIA			x	80-40717-0A	35	N/A	N/A
64	CASE BOTTOM W/O PCMCIA			x	24-45479-0A	35	N/A	N/A
65	CASE IR			x	24-45487-00	30	N/A	N/A
66	Module TOP CASE	x		x	80-00104-00	30	N/A	N/A
67	SPEAKER ZK-28E-02			x	21-20734-00	30	N/A	N/A
68	FPC CCABLE GP/B TO G/P FPC			x	22-21277-00	30	N/A	N/A
69	GLIDE/PAD KGDDET009A			x	71-23008-00	30	N/A	N/A
70	M/E G/P FRAME			x	80-00105-00	30	N/A	N/A
71	K/B Cover			x	80-40727-00	30	N/A	N/A
72	PLASTIC-M TOP COVER			x	80-40728-00	30	N/A	N/A
73	FPC CCABLE GP/B TO MB			x	22-21278-00	30	N/A	N/A

FRU Parts Listing

ITEM	FRU	FRU Level			FIC Part Number	Lead Time (days)	Warranty Period	Return to FIC/Customer for Repair
		A	B	C				
74	GLIDE PAD BOARD			x	51-71390-02	30	N/A	N/A
75	Module LCD TFT 14.1' AU	x			56-10620-00	N/A	N/A	N/A
76	LCD 14.1" B141XN04 AU			x	71-10629-01	60	12 Mth	FIC
77	INVETER/B			x	12-01507-02	60	12 Mth	FIC
78	CABLE-M LCD FPC/CABLE 14.1' AUT			x	22-10902-00	60	N/A	N/A
79	CASE LCD CABLE BOX			x	24-45486-00	60	N/A	N/A
80	RUBBER FOR LCD BEZEL			x	24-83845-00	30	N/A	N/A
81	LCD BEZEL FOR 14.1			x	80-40725-00	30	N/A	N/A
82	LCD COVER BACK FOR 14.1			x	80-40732-00	30	N/A	N/A
83	FRAME HINGE-L			x	80-50197-00	30	N/A	N/A
84	FRAME HINGE-R			x	80-50198-00	30	N/A	N/A
85	Module LCD TFT 14.1' ADT	x			56-10623-00	N/A	N/A	N/A
86	LCD 14.1" L141X2-1 ADT			x	71-10574-01	60	12 Mth	FIC
87	INVETER/B			x	12-01507-02	60	12 Mth	FIC
88	CABLE-M LCD FPC/CABLE 14.1' AUT			x	22-10902-00	60	N/A	N/A
89	CASE LCD CABLE BOX			x	24-45486-00	60	N/A	N/A
90	RUBBER FOR LCD BEZEL			x	24-83845-00	30	N/A	N/A
91	LCD BEZEL FOR 14.1			x	80-40725-00	30	N/A	N/A
92	LCD COVER BACK FOR 14.1			x	80-40732-00	30	N/A	N/A
93	FRAME HINGE-L			x	80-50197-00	30	N/A	N/A
94	FRAME HINGE-R			x	80-50198-00	30	N/A	N/A
95	Module LCD TFT 15" HANNSTAR	x			56-10624-00	N/A	N/A	N/A
96	LCD 15" HANNSTAR			x	71-10639-01	60	12 Mth	FIC
97	INVETER/B			x	12-01507-02	60	12 Mth	FIC
98	CABLE-M LCD FPC/CABLE 15" HANNSTAR			x	22-11060-00	60	N/A	N/A
99	RUBBER FOR LCD BEZEL			x	24-83845-00	30	N/A	N/A
100	LCD BEZEL			x	80-40726-00	30	N/A	N/A
101	LCD COVER BACK			x	80-40732-00	30	N/A	N/A
102	FRAME HINGE-R			x	24-51931-00	30	N/A	N/A
103	FRAME HINGE-L			x	24-51930-00	30	N/A	N/A
104	POWER CORD	x			22-30135-00	30	N/A	N/A
105	AC ADAPTOR	x			12-01468-02	35	12 Mth	FIC
106	Keyboard(US)	x			71-31677-00	35	12 Mth	FIC
107	Keyboard(UK)	x			71-31677-01	35	12 Mth	FIC
108	Keyboard(JAP)	x			71-31677-13	35	12 Mth	FIC